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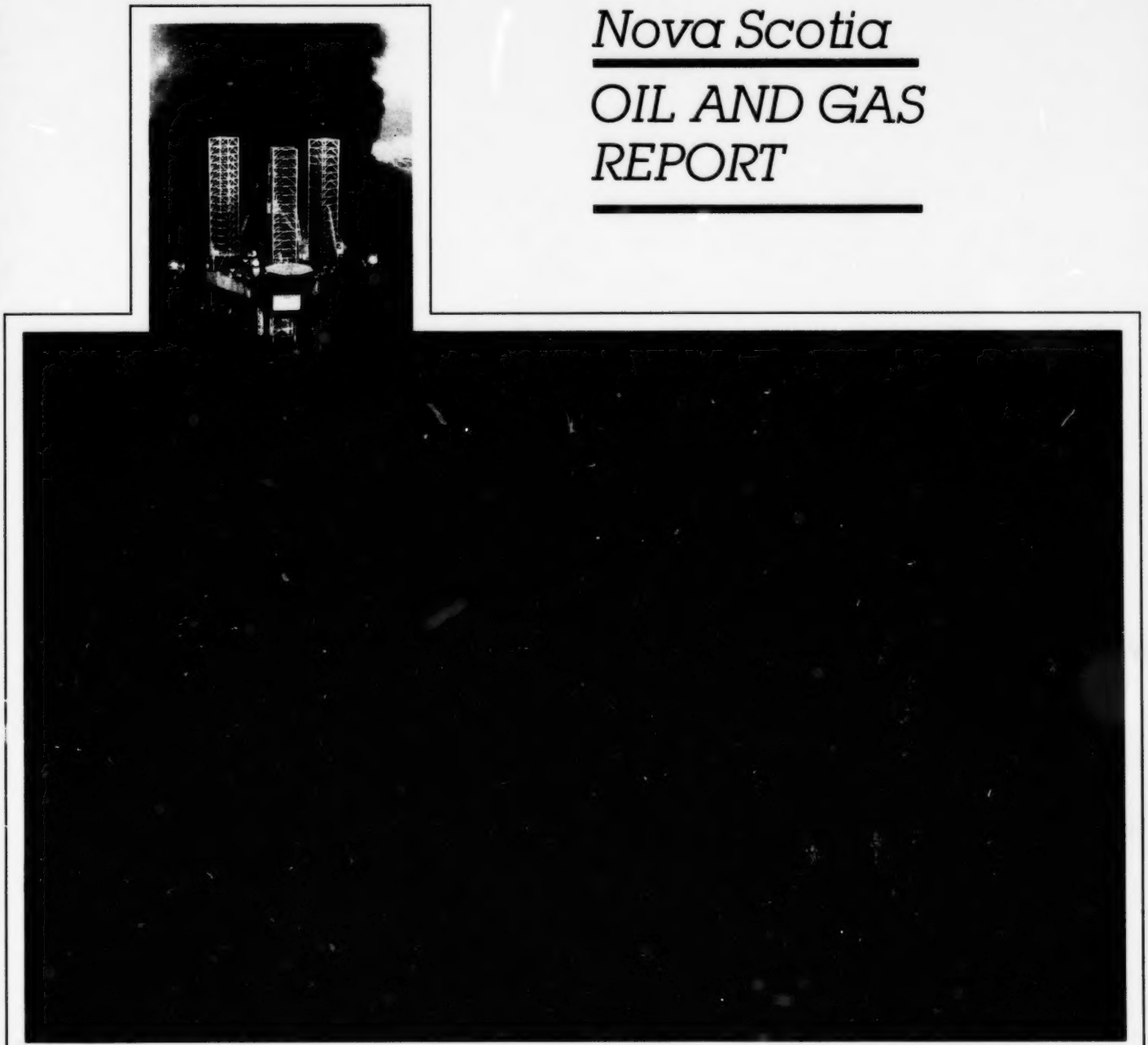
Nova Scotia
OIL AND GAS REPORT



1986

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Nova Scotia
OIL AND GAS REPORT

1986

Nova Scotia

Department of Mines and Energy

Honourable Joel R. Matheson, Q.C.
Minister

John J. Laffin, P.Eng.
Deputy Minister

Cover: The scene shows Sable Island and an inset picture of the Rowan Gorilla I flaring at Cohasset A-52 in March, 1986.

MINISTER'S MESSAGE

Honourable Joel R. Matheson, Q.C.

It is my pleasure to report on the oil and gas exploration developments in Nova Scotia during the past year.

In spite of a worldwide slowdown in the oil and gas industry, due to lowered world oil prices, there were some notable bright spots in Nova Scotia.

The Government of Nova Scotia and the Government of Canada have concluded a new Offshore Petroleum Resources Accord, which will replace the Canada-Nova Scotia Offshore Agreement signed in 1982.

This new Accord establishes improved management and revenue sharing arrangements for the offshore area. Under these arrangements Nova Scotia has authority over Development Plan approval as well as control of fiscal instruments as if the petroleum resources were on the land portion of the Province.

The Province also successfully concluded negotiations for onshore exploration agreements under the Petroleum Resources Act. These agreements signed with three separate companies for three-year terms could spark new interest in onshore exploration activity over the next few years.

Last year I predicted that the number of offshore wells drilled in 1986 would be near our five-year annual average of eight. I am pleased to report that this objective will be achieved; five wells were already spudded by June 1986. During 1986, we have had our share of drilling successes as well.

Earlier this year, two important discoveries were made off Nova Scotia: a significant gas discovery at the North Triumph Field and an oil discovery at Cohasset. The North Triumph gas discovery will add to the discovered gas reserves in the Sable Island area. The Cohasset oil discovery, according to industry officials, could be brought into production in a very short space of time. Production from this field could occur as soon as the world oil price moves to the $20-$25 (U.S.) level.

In February of this year we requested industry to nominate crown lands they would like to have available for exploration. As a result of their nominations, four parcels of land were put out for bids and we expect to conclude exploration agreements for these later this year.

The offshore oil and gas industry, like any other business, will have its good years and not so good years. There will be peaks and valleys and we, who are a part of this new resource industry, will have to learn to live with both situations. At the same time, it is imperative that government does everything it can to help level out the economic flow from our natural gas and oil developments.

I am optimistic about the Province's offshore prospects and that optimism is shared by the industry. This enthusiasm is based on the facts of past, present and future discoveries supported by the industry's continuous investment in our offshore.

The industry's continuous presence in the Province speaks for itself. The hundreds of millions of dollars invested in the offshore by the oil companies before, during and after the Petroleum Incentive Payment Program represent a sizeable investment which has had a very positive impact on the economy of Nova Scotia. This continuing investment clearly demonstrates their belief in the offshore potential for Nova Scotia.

I have every confidence in the future growth and development of Nova Scotia's offshore oil and gas industry. I look forward to the early commencement of our first project.

Joel R. Matheson

Joel R. Matheson, Q.C., Minister

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OIL AND GAS EXPLORATION AND DEVELOPMENT

OFFSHORE EXPLORATION

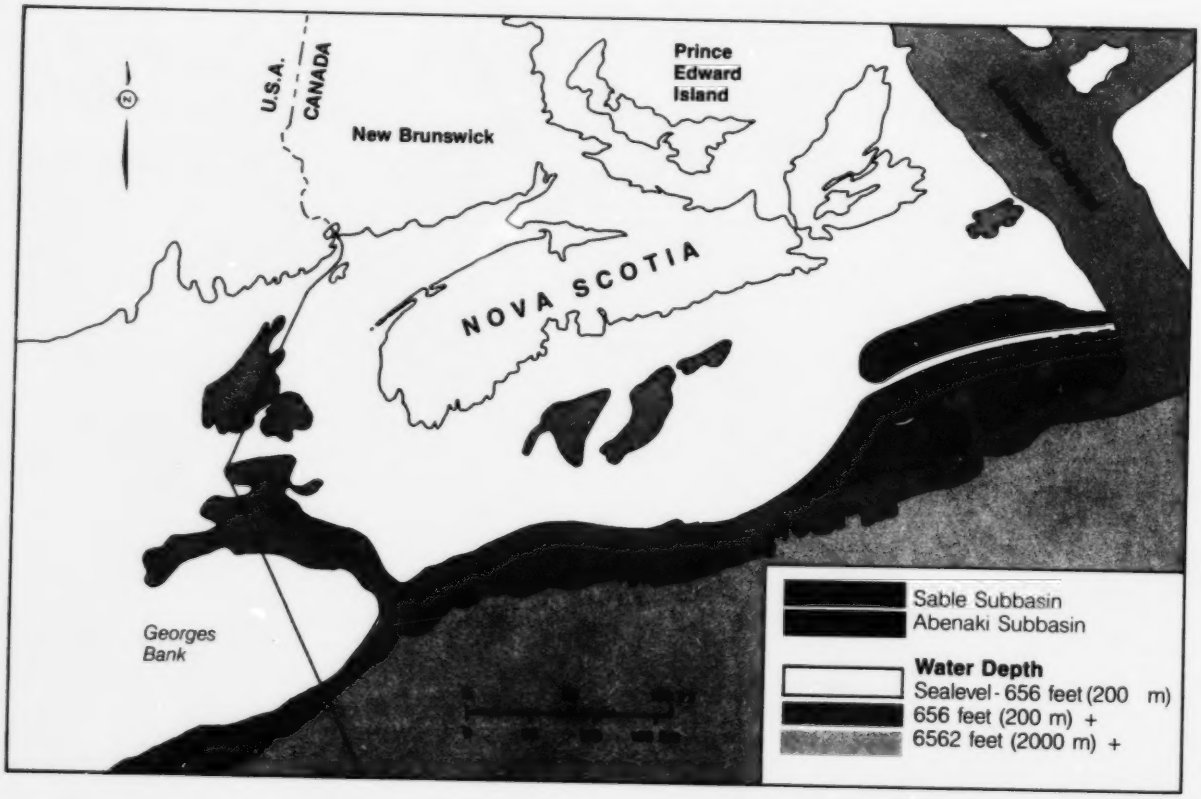
1 GEOLOGICAL SETTING

PHYSIOGRAPHIC FEATURES

Nova Scotia's offshore region covers an area of approximately 100 million acres (40 million ha) and includes both the Scotian Shelf and the Scotian Slope which together form part of the continental margin of eastern Canada. The margin is composed of three distinct parts: the continental shelf, which gently tilts away from the coast for approximately 150 miles (240 km) in water depths of up to 1,300 feet (400 m); the continental slope, a much narrower zone where water depths increase fairly rapidly to 8,200 feet (2 500 m); and the continental rise, the narrow band of transition between the slope and the deep ocean basin marking the outer edge of the continental margin.

The areas of greatest interest for oil and gas exploration on the Scotian Shelf and Scotian Slope are those underlaid by thick accumulations of sedimentary rock. The Scotian Shelf is one of Canada's largest sedimentary basins. It consists of about 40 million acres (16 million ha), stretching for 435 miles (700 km) from Georges Bank in the west to the Laurentian Channel in the east, and ranges in width from 76 to 142 miles (122 to 228 km). Sediments capable of producing hydrocarbons are found throughout the Scotian Shelf and about 16.5 million acres (6.7 million ha) are currently licensed for oil and gas exploration.The greatest thickness of sediments occurs in the Sable Subbasin (Figure 1) where the majority of oil and gas discoveries on the Shelf have been made.

1 Offshore Physiographic Features



Sable Island Bank is a central feature of the Scotian Shelf, extending 160 miles (260 km) east-west and 50 miles (80 km) north-south, and containing Sable Island, a 20-mile (32-km) long, narrow arc of sand. Altogether, 64 wells have been drilled in the Sable Subbasin (out of a total of 117 wells on the Scotian Shelf and Scotian Slope), including 9 wells drilled on the island itself.

Formations deposited during the Jurassic and Cretaceous periods, 195 to 65 million years ago, (Figure 2), are central to the hydrocarbon potential of the Scotian Shelf, and of the Sable Island area in particular. These sediments were laid down in stages, beginning with the deposition of a thick layer of salt in a rift basin formed as the North American continent separated from the North African land mass in Early Jurassic time. The salt, subsequently buried under (now) overlying rocks, flowed upward to form pillows, domes and diapirs that now underlie many of the present hydrocarbon bearing structures.

Carbonate banks, formed later in Jurassic time, produced thick deposits of limestone. The limestones, which include the important Baccaro carbonate front found along the edge of the Scotian Shelf, contain potential hydrocarbon reservoir rocks.

Throughout the Cretaceous, a series of coarse clastic sandstones known as the Missisauga Formation were deposited over the shelf margin and the Baccaro carbonate front. Seaward of this front, the coarse sands gradually became interbedded with shale and finally were replaced by shale. During the burial of the carbonate by sandstone and shale, a series of subsea deltas formed across the Scotian Shelf. The sea drowned out the deltas in Late Cretaceous time, covering them with shale.

The deltas and their associated thick sandstones have been a major factor in accumulations of oil and gas on the Scotian Shelf. Shale and sandstone deposited as alternate layers provided both source and reservoir rocks. Thick organic rich sediments, formed from the load swept in by river systems that formed the deltas, were buried deep enough to generate hydrocarbons. Deep salt layers and/or basement block configuration and faults contributed the necessary relief and trapping mechanisms for the formation of oil and gas fields in these areas. The Sable Subbasin and Abenaki Subbasin were centers of maximum deposition of sediment. Most of the major hydrocarbon finds to date occur near the centers of maximum deposition in these areas.

RESERVOIRS AND TRAPS

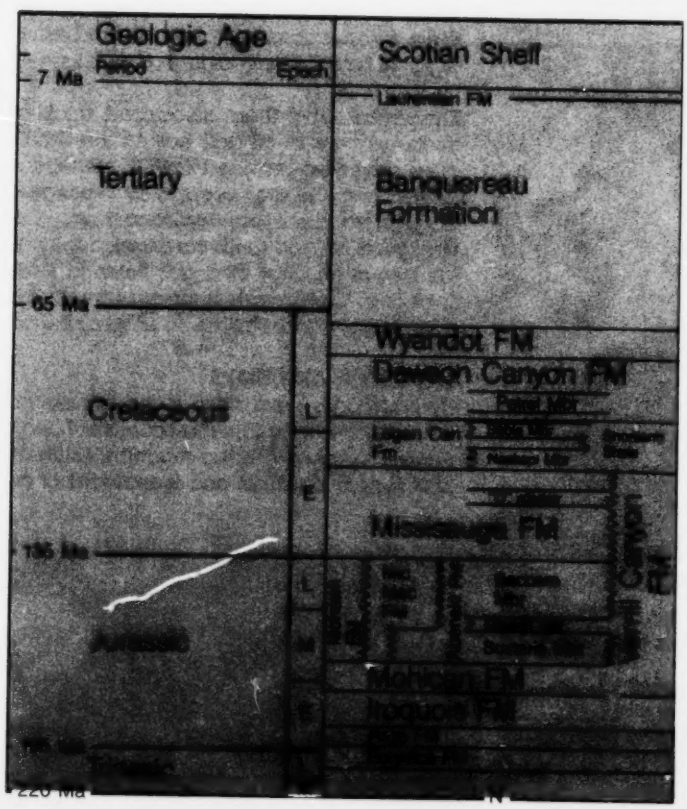
Hydrocarbons have been found in reservoirs ranging in age from Late Cretaceous to Early Jurassic time. The most consistent and successful oil and gas discoveries have been related to down-to-basin structural faults that extend through the Sable Subbasin. The fault system parallels and is seaward of the Baccaro carbonate bank. Gas-producing

zones have been discovered in interbedded sandstones and shales of Late Jurassic and Early Cretaceous age in the MicMac and Missisauga Formations. These sands are by and large overpressured and many wells in the area have encountered overpressured sands (Figure 3). There has been a strong interest in finding overpressured reservoirs because they typically have high flow rates due, in part, to higher than normal porosities.

Overpressured reservoirs are typically deep — 15,000+ feet (4 572 m). The additional drilling time required to reach them and the specialized high pressure equipment used on the rig to deal with pressures in the range of 12,000-15,000 psi (83 000-103 000 kPa) make them expensive to drill. Overpressured reservoirs have drawn particular attention in past years as a result of blowouts at the Uniacke G-72 well in May 1983 and at West Venture N-91 in September 1984. In fact the first well drilled in offshore Nova Scotia, Mobil's Sable Island C-67, experienced a kick from an overpressured reservoir at the well's final depth of 15,106 feet (4 604 m).

More recently drilling has been directed at shallower reservoirs of more normal pressure, reflecting industry's attempt to discover additional reserves but at decreased cost.

2 Stratigraphic Diagram of Lithologic Units



Ma	Million of years before present
L	Late
M	Middle
E	Early
FM	Formation
Mbr	Member

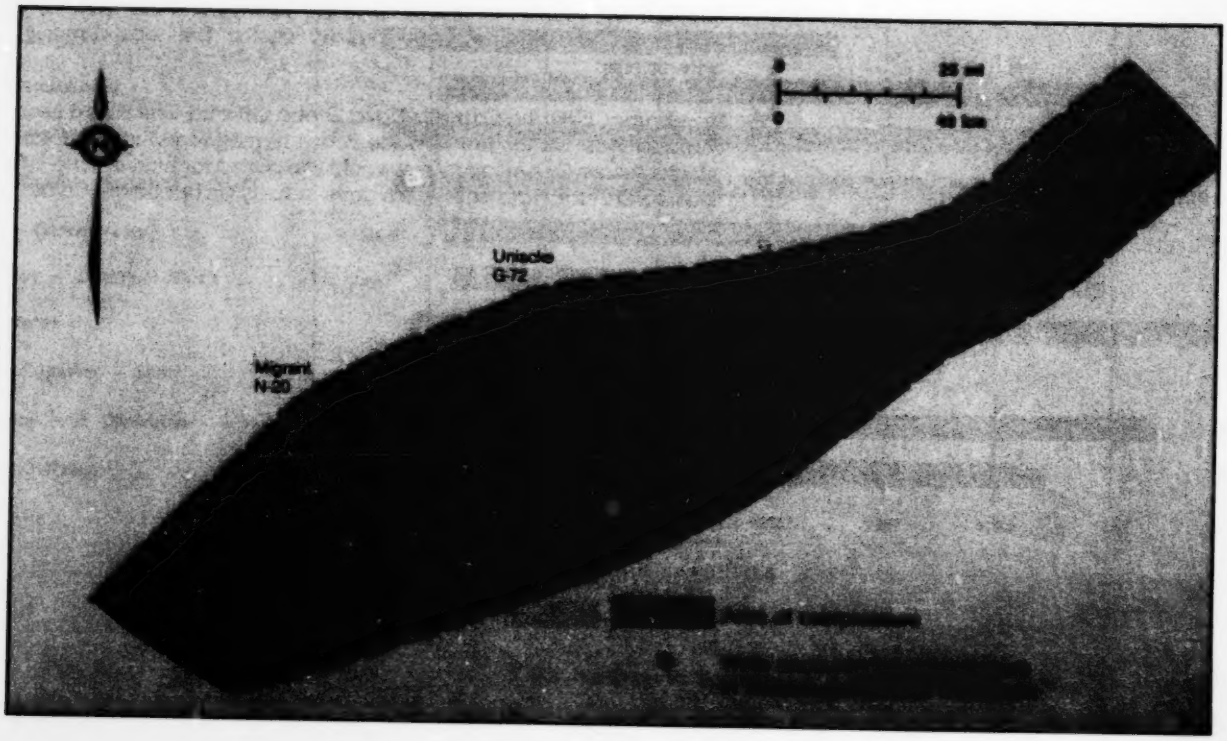
A new exploration fairway has developed south of Sable Island where the Alma, Glenelg, North Triumph, and Chebucto fields have been drilled. The Cretaceous age sands in the area show promise of productive reservoirs which could add additional reserves to the previously discovered fields at Venture, Thebaud, and South Venture, and thus contribute to a commercially viable project.

Hydrocarbons have also been found associated with salt dome structures that underlie much of the sediment in the Sable Island area. However, these structures have proven to be severely faulted and as a result the hydrocarbon distribution is complex. Many such structures were identified during drilling in the 1970's.

A search for turbidite fans — having similar characteristics to deltas and formed by slumping along the slope — has been pursued along the deep water areas of the Scotian Slope. In some areas of the world such deposits have been prolific producers.

As the understanding of the geology of offshore Nova Scotia matures and drilling technology advances, new areas and new drilling targets will undoubtedly be identified.

3 Wells Encountering Overpressured Formations in the Sable Island Area



2 MANAGEMENT OF OFFSHORE LANDS

MILESTONES

Many significant events involving Nova Scotia's offshore lands have occurred since the signing of the Canada-Nova Scotia Offshore Agreement on Resource Management and Revenue Sharing on March 2, 1982. Highlights of key land activities during the past four years are as follows:

1982 In March, 1982, the **Canada-Nova Scotia Offshore Oil and Gas Board** was established to manage oil and gas resource activity off the coast of Nova Scotia. Oil companies formerly holding provincial licenses or federal leases began negotiating exploration agreements with the newly established Board.

1983 The first well under the new exploration agreement regime, West Esperanto B-78, was drilled in May 1983. Subsequently, approximately 40 exploration and delineation wells were drilled.

1984 May 1984, brought the conclusion of negotiations with oil and gas companies for 35 first-round exploration agreements calling for 46 wells to be drilled by 1988. In July, the **Canada-Nova Scotia Agreement** was proclaimed in legislation by the Governments of Nova Scotia and Canada. Later that year, in October, the World Court rendered a decision on the Canada/U.S. boundary line in the Gulf of Maine. The decision opened the possibility of exploratory drilling on the Canadian portion of Georges Bank.

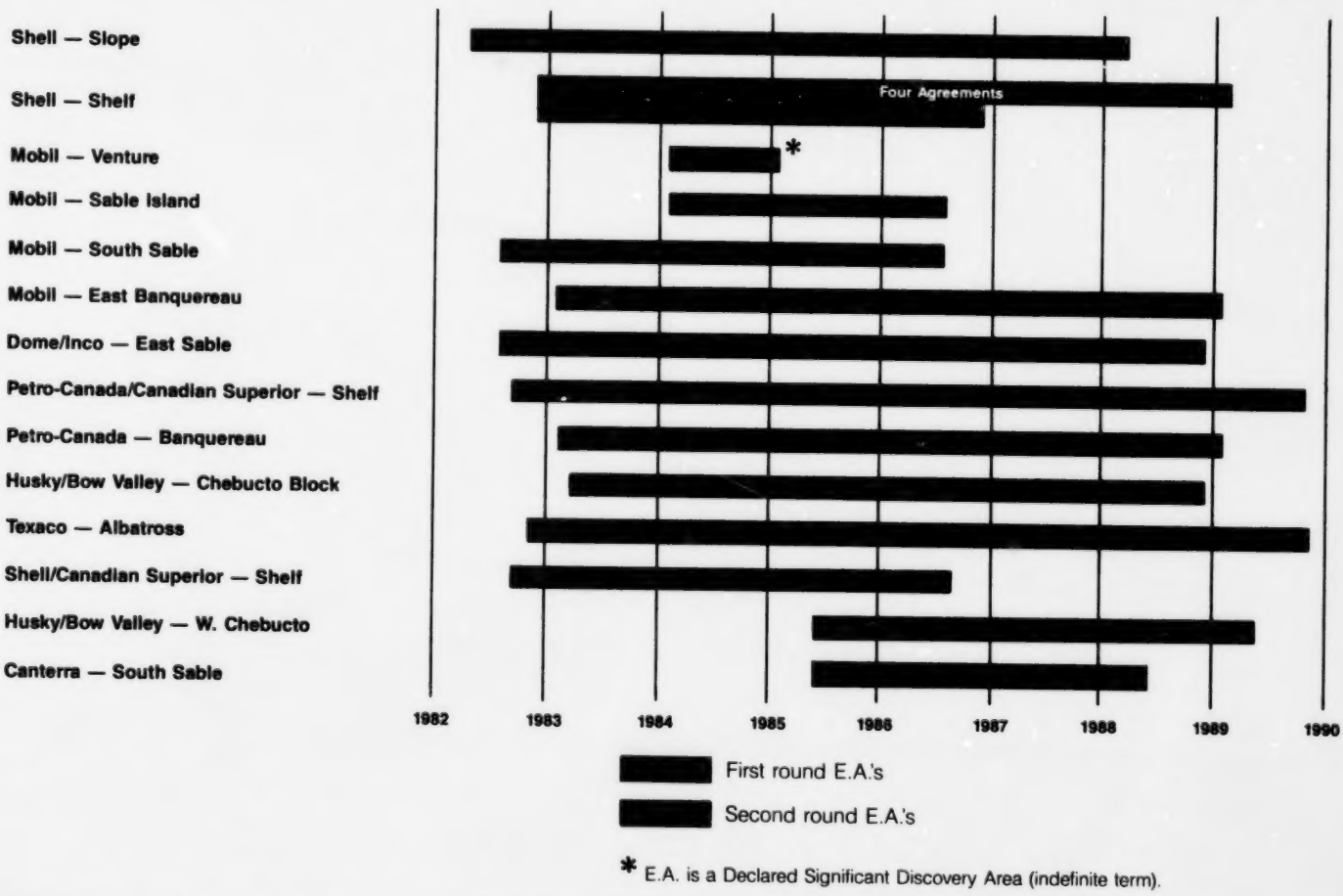
1985 In April 1985, the first new offshore lands since 1982 were awarded to two exploration groups, one led by Canterra Energy and the other by Husky Oil. In December, negotiations were finalized on the first second-round exploration agreements.

1986 In February 1986, the **Canada-Nova Scotia Oil and Gas Board** issued a **Call for Nominations**. For the first time the Board requested industry to formally indicate which offshore Crown lands they would like posted for bids. In June 1986, the Board issued a **Call for Proposals** which gave industry an opportunity to bid on the lands which industry has nominated.

EXPLORATION AGREEMENTS

Thirty-seven exploration agreements (E.A.'s) have been negotiated in Nova Scotia's offshore region since 1982. The two most recent were West Chebucto and South Sable, awarded in April 1985, and covering lands to the south and southwest of the Venture gas field. By the end of June 1985, 29 exploration agreements were in effect. The remainder, having been allowed to expire, were surrendered to the Crown. Of the 29, 11 remained in place through June 1986, 15 reached the end of their term, and 3 were surrendered before the end of their term. Mobil, Shell, Petro-Canada, Dome, and Husky/Bow Valley negotiated another term on 10 of the 15 E.A.'s which had expired during this period, resulting in 10 second-round agreements (Figure 4).

4 Duration of Current Exploration Agreements



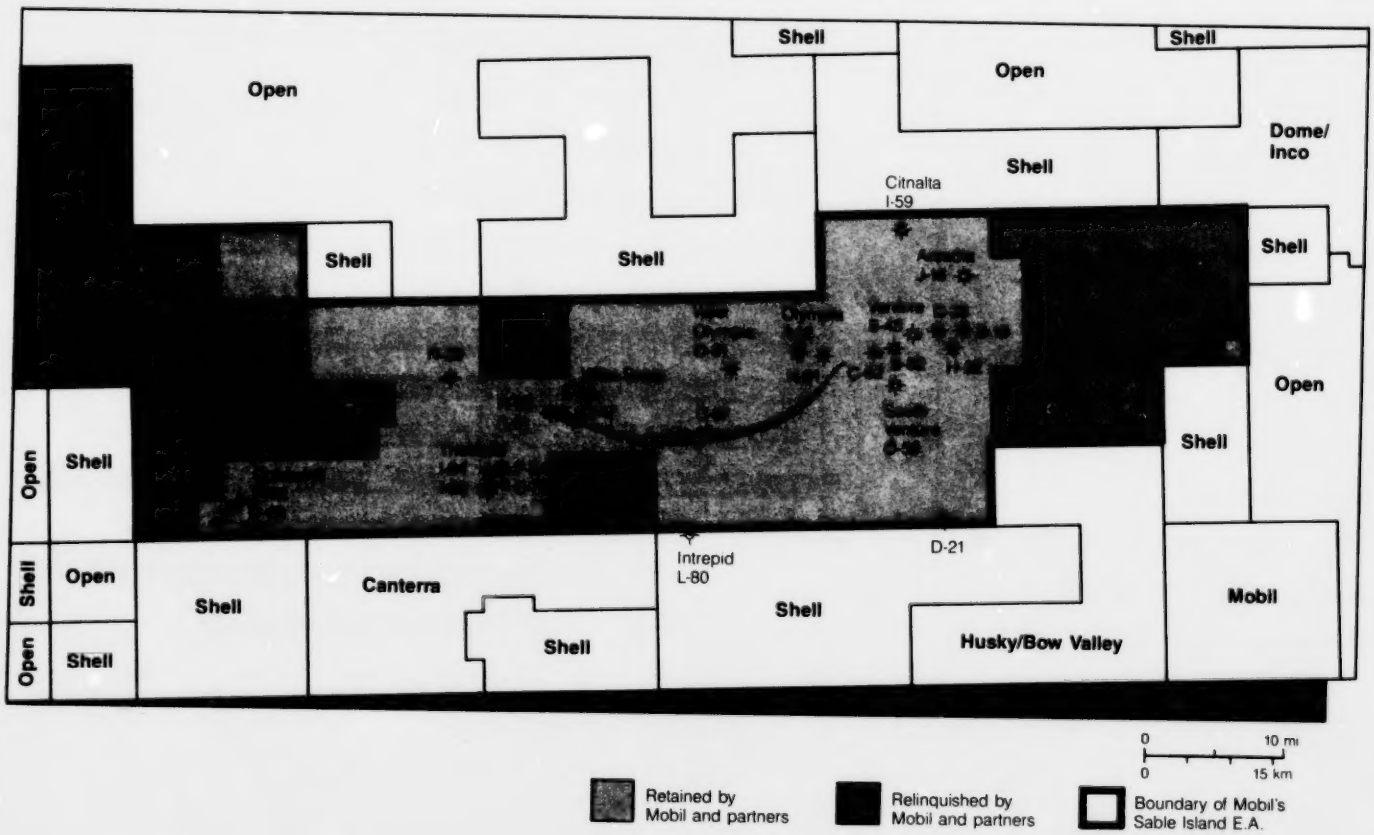
As of June 1986, 21 E.A.'s, including 11 first-round agreements, were in effect. Many of the first-round agreements still in effect are expected to be renegotiated into second-round E.A.'s before May 1989.

The Venture exploration agreement, which encompasses the Venture significant discovery area (S.D.A.), will remain in place indefinitely.

The second-round E.A.'s will have the following conditions:

- a three-year term for Shelf lands and a four-year term for Slope lands,
- annual rental fees commencing the second year, and refundable by work carried out, and
- surrender of all lands at the end of the term with the exception of those with significant discovery status.

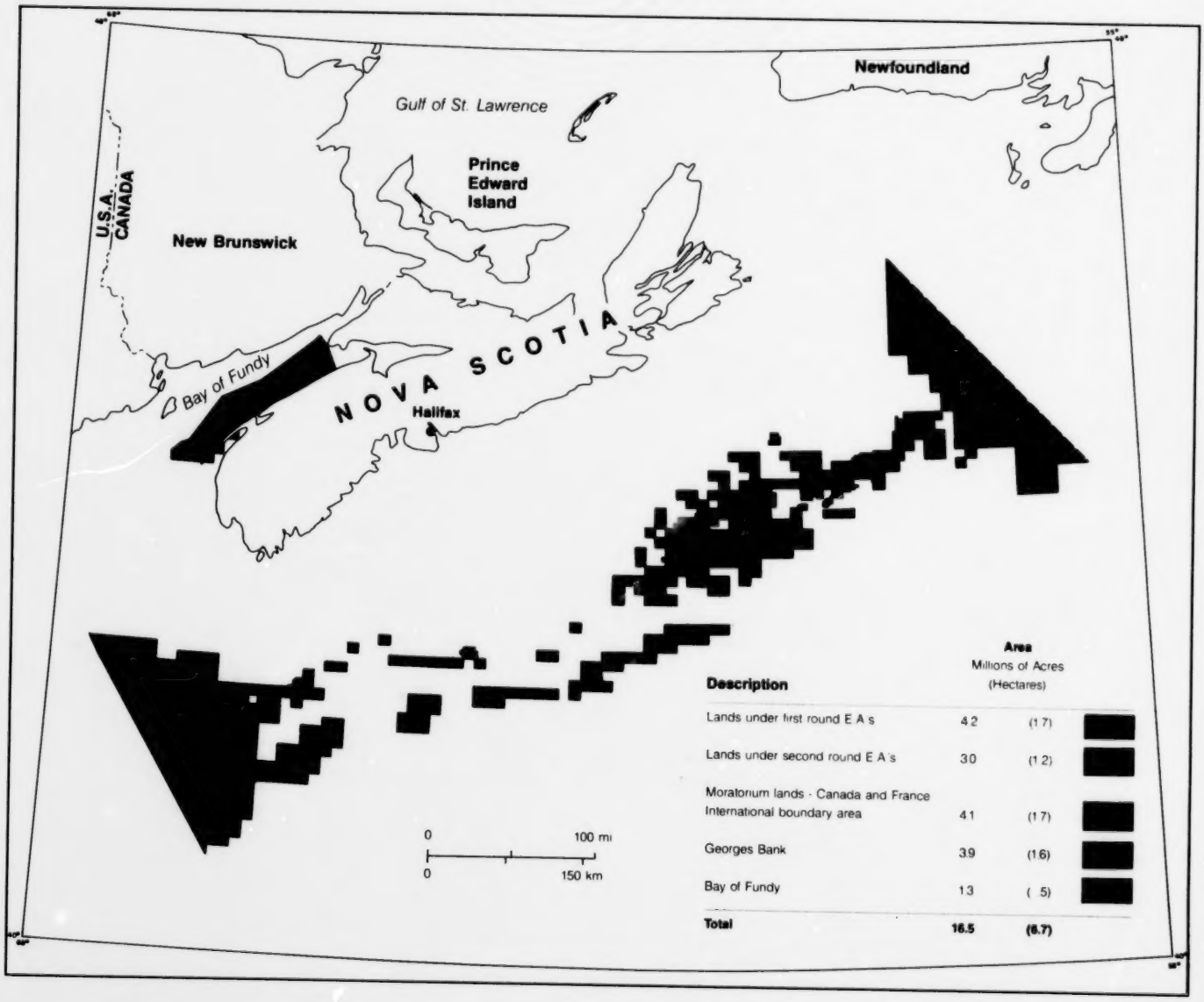
5 *Crown Lands Resulting from Mobil's Sable Island Relinquishment*



In addition, prospective E.A.'s that could contribute reserves to the first offshore commercial development will have drilling requirements within the first two years.

All first-round exploration agreements had provision for relinquishment or surrendering of lands. Relinquishment allowed a 50 percent reduction in a company's holdings before the end of the term of the agreement. About 7.1 million acres (2.9 million ha) of offshore lands were surrendered under the first-round of agreements, including the first

6 *Lands Held by Exploration Companies — June 1986*



Description	Area Millions of Acres	(Hectares)
Lands under first round E.A.s	4.2	(1.7)
Lands under second round E.A.s	3.0	(1.2)
Moratorium lands - Canada and France International boundary area	4.1	(1.7)
Georges Bank	3.9	(1.6)
Bay of Fundy	1.3	(.5)
Total	**16.5**	**(6.7)**

relinquishment on Mobil and partners' Sable Island block (Figure 5). Mobil has held the oil and gas rights on the parcel since April 1959. Relinquishment freed 527,507 acres (213 482 ha) in the prospective Sable Island area.

As of June 1986, 16.5 million acres (6.7 million ha) of the 100-million-acre (40-million-ha) offshore region covered by the Canada-Nova Scotia Offshore Agreement had petroleum rights issued (Figure 6).

Lands for which petroleum rights are not issued are termed Crown reserve lands. Rights can be issued to interested companies through a process called the Posting of Lands. This process includes a Call for Nominations and a Call for Proposals, followed by an evaluation of bids and the award of E.A.'s for the lands.

The first Call for Nominations for offshore Nova Scotia was issued by the Canada-Nova Scotia Offshore Oil and Gas Board in February 1986, and requested industry to formally indicate which Crown lands they would be interested in acquiring offshore. A Call for Proposals followed in June 1986 (Figure 7) and will remain open until October 8, 1986, to allow industry to evaluate the lands and prepare proposals. Proposals will be evaluated on the basis of a work bonus bid — the total amount of money a bidder commits to spend on the lands. An exploration agreement with the following provisions will be issued to successful bidders:

- a six-year term divided into two three-year periods,
- a requirement for the drilling of at least one well during the first period in order to validate the agreement for the second period,
- no interim relinquishment requirement,
- no annual rental fees during the initial period,
- rentals in the second period (years 4, 5, and 6) commencing at $2.02 per acre ($5/ha) in the fourth year and increasing by $2.02 per acre ($5/ha) each year until the sixth year is reached,
- a deposit required amounting to 25 percent of the Work Bonus Bid, refundable against allowable expenditures incurred during the first period, and
- the right of companies to retain only significant discoveries at the end of the renewal term.

New lands issued in the fourth quarter of 1986 resulting from the Call for Proposals are expected to stimulate additional future drilling activity in the offshore.

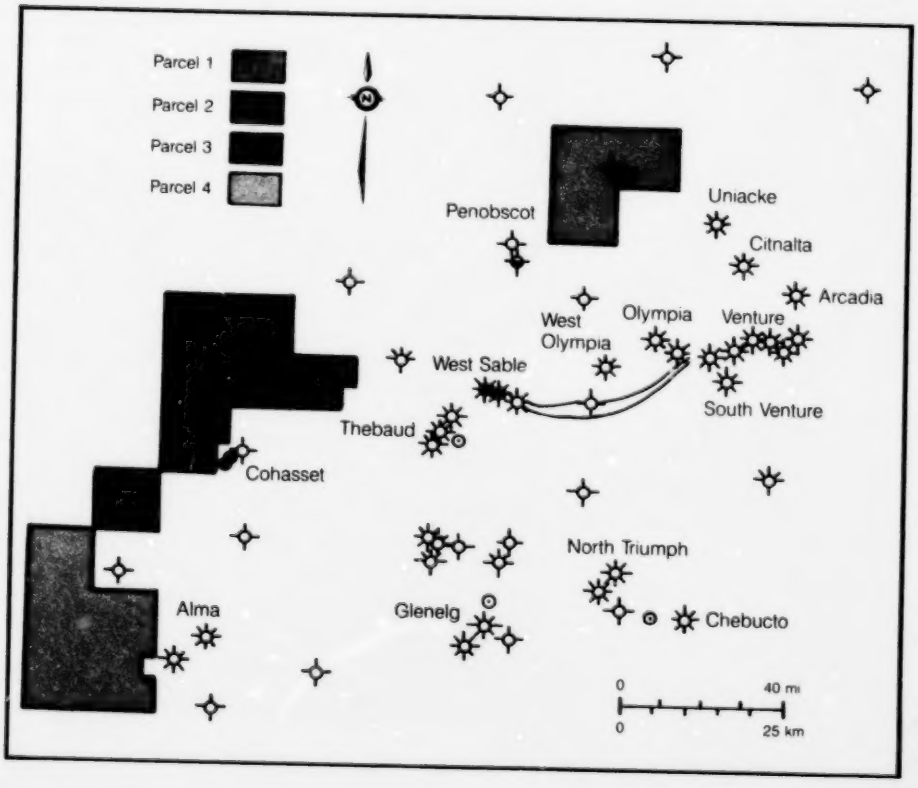
GEORGES BANK

Canada was awarded jurisdiction over one-sixth of Georges Bank as a result of the World Court decision on the Canada-United States boundary in October 1984. Companies including Chevron, Dome, Prodeco, and Texaco have oil and gas rights in this area and must renegotiate exploration agreements.

However, before these E.A.'s can be concluded and exploration can proceed, the impact of oil and gas exploration on the environment and the fishing industry in the Georges Bank area requires assessment.

Federal and provincial governments have jointly prepared a detailed screening document which analyzes these impacts. The report will be reviewed by the petroleum and fishing industries, and any concerns will be addressed before exploration is allowed to proceed.

7 Lands under Call for Proposals — June 1986



3 EXPLORATION ACTIVITY

The past year will not be easily forgotten by Nova Scotia's petroleum industry. Records were set both in deep water drilling for the Canadian offshore and in oil well productivity for the East Coast. A significant level of exploration occurred despite decreases in activity caused by the recent drop in world oil prices.

Drilling commenced on 10 wells (including a relief well for the West Venture N-91 well) in 1985, compared with a peak of 14 wells in 1984 and an average of 8 wells per year since 1981 (Figure 8). In addition five wells were spudded in the first five months of 1986. Current drilling activity thus reflects a return to the level of exploration prevalent in the early seventies (1972-74) and the early eighties (1981-83) when an average of eight wells per year were started. Thirteen of 15 new wells drilled since the beginning of 1985 were within a 50-mile (80-km) radius of Sable Island, where drilling activity continues to focus.

Exploration companies acquired 16,662 miles (26 814 km) of seismic data on the Scotian Shelf and Slope during 1985 (Figure 9). Although no new seismic data had been acquired by mid-1986, companies continued to evaluate existing data on their offshore lands. As of June 1986, several seismic programs were planned for offshore Nova Scotia, including a 3-D (three dimensional) seismic survey to provide further detail on the Cohasset oil discovery.

During 1985 and the first half of 1986, average well costs on the Scotian Shelf continued to decline from the 1981-84 period averages (Figure 10).

The decrease was largely the result of a reduction of rig and support vessel rates due to stiff competition worldwide. Rig and support vessel expenditures can make up over 40 percent of the daily cost of a one-well drilling program. Shallower drilling targets and improved efficiency in drilling operations also contributed to lower well costs.

SHELL

Shell and partners were the most active exploration consortium in the Nova Scotia offshore during the 12 months preceding June 1986, completing four wildcat wells, one delineation well, and spudding an additional well (Figures 11, 12). Shell made one gas discovery (North Triumph G-43) which was delineated by the successful North Triumph B-52 well. The five wells completed in the past year (Kegeshook G-67, Merigomish C-52, North Triumph G-43, North Triumph B-52, and Tantallon M-41) brought Shell's total under the first round of E.A.'s to 13 wells on the Scotian Shelf and 2 on the Continental Slope. Of these, 9 are considered part of Shell's 15-well commitment. Shell will probably drill one more well during 1986 under first-round agreements. By the end of 1985, Shell had renegotiated four second-round exploration agreements which will result in additional drilling between 1986 and 1989.

Shell and partners contracted the jack-up *Glomar Labrador 1* and the semi-submersible *Sedco 706* until late summer 1985, and used *Sedco 709*, a semi-submersible returning from drilling for Esso Resources off Newfoundland, from September 1985 until April 1986. One of the two wells *Sedco 709* drilled, Tantallon M-41 on the Scotian Slope, set a new water depth record for drilling in offshore Canada — 4,974 feet (1 516 m). Shell also used the *John Shaw* from January to March 1986, to drill a delineation well on the North Triumph discovery. As of June 1986, the *SDS Vinland* had been contracted by Shell and had started drilling a new well (Glenelg N-49) directly north of the Glenelg discovery. Completion was expected in late July 1986.

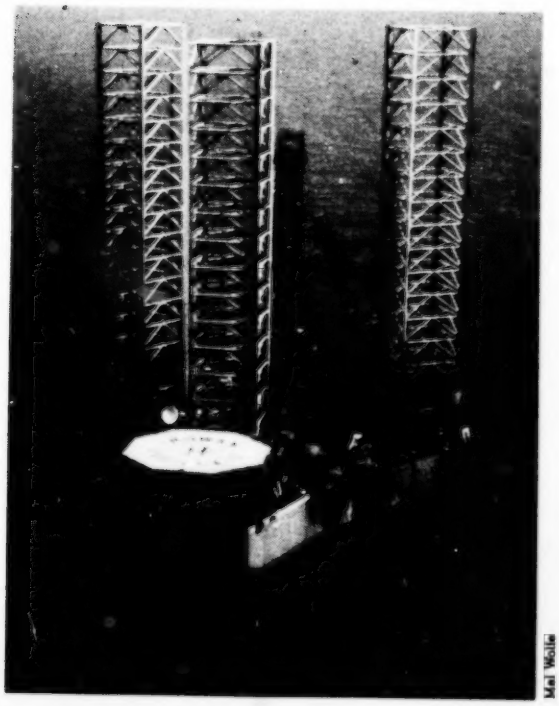
MOBIL

Mobil and partners completed one wildcat and one delineation well on their Sable Island E.A. between March and November 1985 (Figures 11, 12). West Olympia 0-51, a wildcat, was completed on November 9, 1985, and encountered significant gas while the delineation well, Thebaud I-93, was completed on September 30, 1985, and encountered both gas and condensate, verifying the producibility of the main reservoir on the Thebaud structure. In June 1986, after a five-month break, Mobil began drilling a delineation well, the fourth well on the Thebaud field. Under Mobil's current exploration agreement for the Sable Island Block, the West Olympia 0-51, Thebaud I-93, and the West Venture N-91 and C-62 wells count for four of the five earning wells required.

The fifth earning well (Thebaud C-74) is expected to be completed in September 1986. The current exploration agreement terminated on July 14, 1986.

Mobil contracted two jack-up drilling units for their drilling program over the past year. The *Rowan Juneau* finished Mobil's Thebaud I-93 well in September 1985, and the *Rowan Gorilla 1* drilled West Olympia 0-51 to completion in November 1985. The *Rowan Gorilla 1* is currently contracted by Mobil to drill Thebaud C-74.

The jack-up rig Gorilla 1 drilling Thebaud C-74



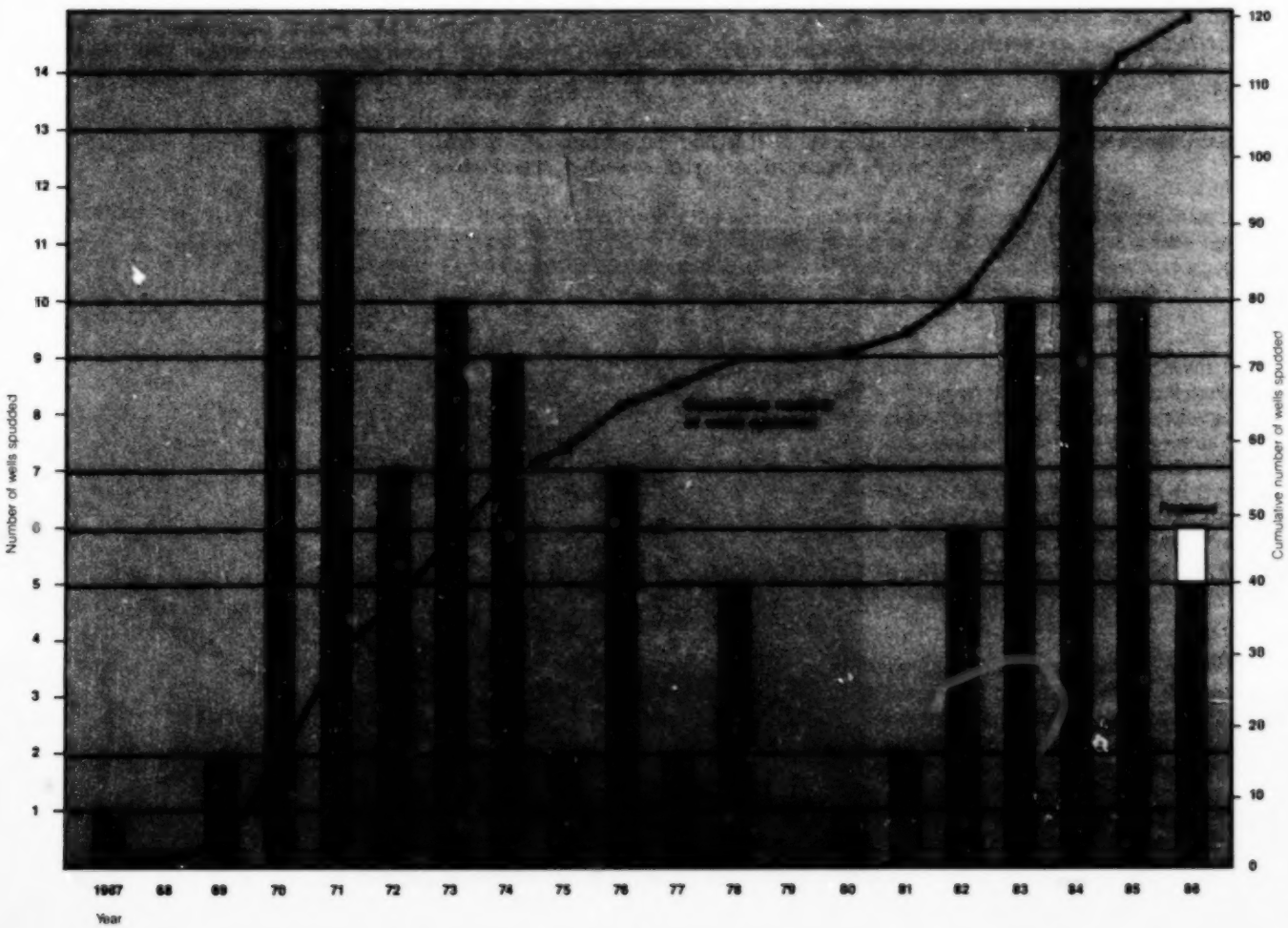
Mel Wolfe

PETRO-CANADA

Petro-Canada and partners completed a wildcat and a delineation well during 1985-86 (Figures 11, 12). Shelburne G-29, which had been earlier suspended, was re-entered and completed to a total depth of 13,140 feet (4 005 m) on September 17, 1985. In December 1985, the consortium started a second delineation well, A-52, on the Cohasset structure where oil had been discovered in 1973. The well was completed on March 27, 1986, with a combined flow rate of 29,200 barrels per day (4 642 m^3/d), a record for the Canadian offshore. The Cohasset structure has strong development potential which currently depends on technical evaluations of well results and economic conditions.

The semi-submersible *Sedco 710* drilled Petro-Canada's Shelburne G-29 well and the *Rowan Gorilla 1* drilled the Cohasset delineation well.

8 *Drilling Activity, Offshore Nova Scotia, 1967-86*

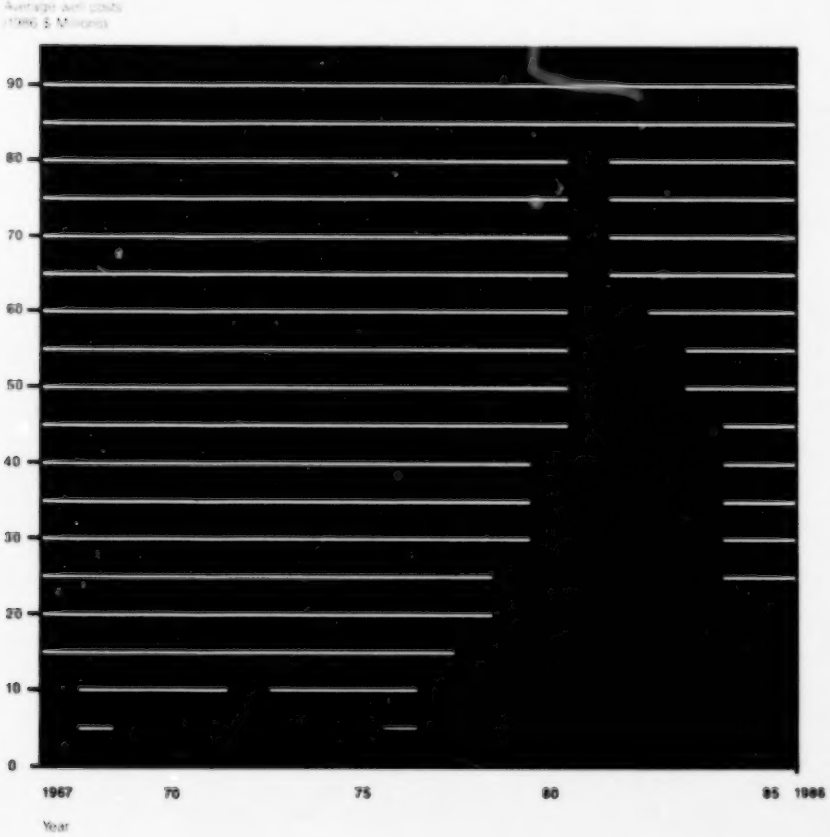


9 *Offshore Statistical Summary, 1981-86*

		1981	1982	1983	1984	1985	1986[1]
First-Round Exploration Agreements Concluded (Based on Effective Dates)		0	26	6	3	2	—
Second-Round Exploration Agreements Renegotiated (Based on Effective Dates)						8	2
Miles of Seismic Shot		11,662	18,909	22,960	13,414	16,662	N/A
Wells Spudded		2	6	10	14	10	5
Wells Completed		1	3	10	13	14	4
Total Footage Drilled		26,227	93,648	178,038	233,090	154,409	N/A
Rigs Active[2]		2	3	6	7	5	3
Dollars spent by Operators (millions)	Seismic	17.4	37.1	48.5	23.2	29.2	N/A
	Drilling	65.0	220.0	564.4	594.7	452.0	N/A
TOTAL		82.4	257.1	612.9	617.9	481.2	N/A

[1] First half. [2] Average number of rigs working during the year.

10 *Average Well Costs Offshore, 1967 — June 1986*



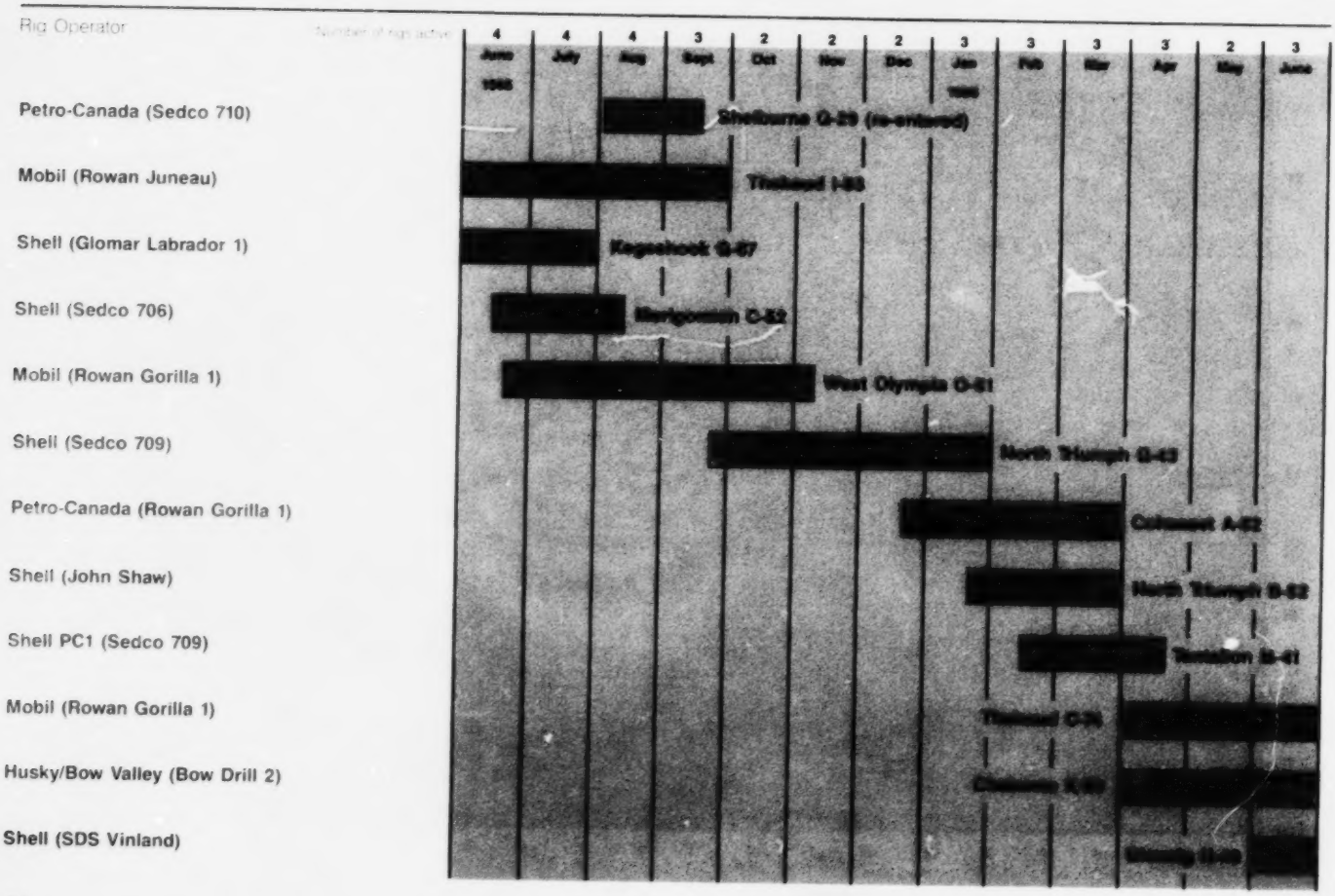
HUSKY/BOW VALLEY

Husky and Bow Valley again conducted an oil and gas exploration program on the Scotian Shelf in the past year, maintaining a presence begun in August 1983, with the drilling of the Glooscap C-63 well.

Husky and Bow Valley first became involved in the Scotian Shelf through farm-in arrangements, in which they agreed to carry out exploration work in return for an interest in the land. This was the case for the Chebucto block exploration agreement on which the Chebucto K-90 discovery well was drilled in 1984. A second-round E.A. was renegotiated on these lands when the first-round E.A. expired on December 16, 1985.

At the end of the 1985-86 period Husky and Bow Valley were actively exploring their West Chebucto lands, secured with other partners in early 1985 through a posting of lands. Chebucto K-20, the first of two required wells on this four-year E.A., was spudded on April 5, 1986, and drilling was in progress as of June 1986 (Figures 11, 12). A third optional well

11 Schedule of Drilling Activity, 1985-86



can be drilled contingent on the results of the first two wells. If the well is not drilled, the term of the E.A. will be three years.

During the past year, Husky/Bow Valley also acquired and analyzed a 3-D seismic survey over West Chebucto and adjacent lands in order to obtain an improved interpretation and better understanding of the West Chebucto, Chebucto, and North Triumph structures.

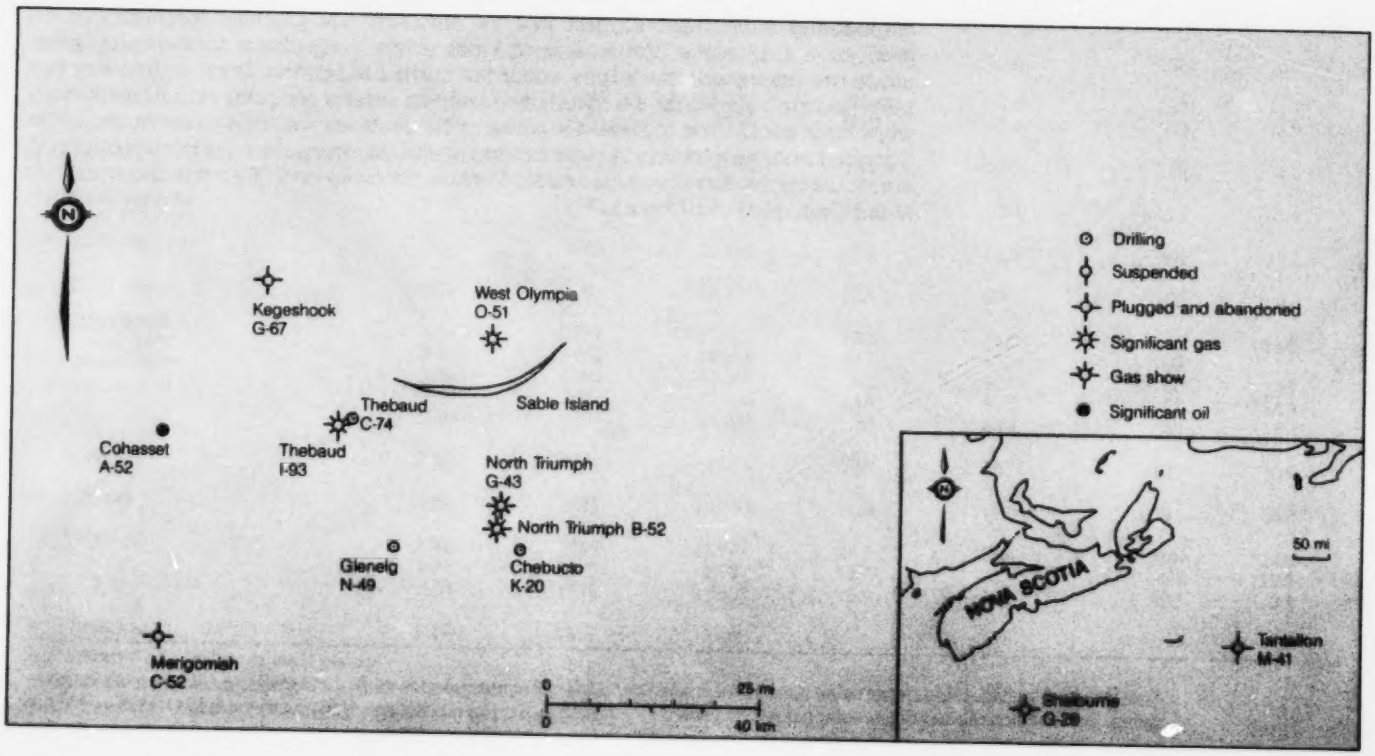
The semi-submersible drilling rig, *Bow Drill 2*, moved from Newfoundland to the Scotian Shelf to drill Chebucto K-20, which was underway as of June 1986.

CANTERRA

Canterra's main interest as a principal operator lies in their South Sable lands, covered by an exploration agreement awarded to a consortium led by Canterra in April 1985. Canterra and partners have since acquired and evaluated seismic data for the lands. Their current exploration agreements require them to conduct 311 miles (500 km) of seismic and drill an earning well prior to May 1, 1987.

Canterra has been active in the past as a partner with Shell, Mobil, and Petro-Canada in various offshore wells. The company is a partner in the Glenelg, Alma, Uniacke, and North Triumph gas discoveries on the Scotian Shelf and during 1985 acquired an interest in the Thebaud gas and Cohasset oil fields through the acquisition of Texas Eastern's interest in those fields. During the 1985-86 period Canterra has been an active participant in 10 of 12 major wells.

12 Offshore Well Locations, 1985-86



4 EXPLORATION AND DELINEATION DRILLING RESULTS

Exploration activity continued to focus on proving additional commercial reserves around Sable Island through delineation drilling of existing discoveries and drilling new structures detected through seismic analysis. By June 1986, the 117th well in Nova Scotia's offshore history had been completed. Of these wells, 72 percent have been wildcats (the first well drilled on a new geological feature) and 28 per cent were delineation wells (to evaluate discoveries).

Seventeen significant natural gas finds and three significant oil discoveries have been recorded since drilling first began (Figure 13). Twelve of the discoveries have come since the 1979 Venture discovery — six on Mobil's Sable Island block, four on Shell Shelf lands, one on Husky/Bow Valley's Chebucto block, and one on Petro-Canada's Banquereau E.A. The success during the past six years can be attributed to the focus of drilling in the Sable Island area as a result of the Venture discovery in 1979; improved geophysical technology; and a greater understanding of the geology of the area as the number of wells drilled in the Sable Island area increased.

In September 1985, the Canada-Nova Scotia Offshore Oil and Gas Board declared 14 discoveries "significant" under criteria established in the current provincial and federal mirror legislation (Figure 14). These discoveries were the first to be accorded such status and will be carried forward under new provincial and federal legislation scheduled to be passed pursuant to the revised Canada-Nova Scotia Offshore Agreement.

In the current legislation, a discovery may be declared significant if a discovery well on a geological structure flows hydrocarbons when tested and if geological and engineering information suggest that the structure has potential for hydrocarbon production. Exploration agreements on lands where a significant discovery has been made are exempted from expiry under the current legislation. Once a discovery has been declared significant, the Board can, however, order a company to drill one or more wells. Each declaration includes the name of the discovery well and a description of the Canada Lands surrounding the well making up the discovery area. Discoveries declared significant by the Board include Mobil's Venture discovery and other gas discoveries by Mobil, Shell, and Petro-Canada.

▶

13 Significant Oil and Gas Discoveries and Test Summary

Oil	No. of Wells Drilled into Each Structure	Key Wells	Year Drilled	Total Depth (ft.)	GAS		OIL	
					Maximum Test Rate (Single Test) (MMCF/d)	Combined Test Rate (MMCF/d)	Maximum Test Rate (bbls/d)	Combined Test Rate (bbls/d)
1. Cohasset	3	A-52	1986	9,340	.270	1.1	7,740	29,200
		D-42	1973	14,521	.071	.096	1,050	1,565
2. Primrose	3	N-50	1972	5,622	17.4	50.5	350	650
3. West Sable	8	0-47	1972	13,775	5.8	6.1	Traces of Oil	
		E-48	1971	11,820	10.6	64.0	2,880	4,080

Gas and Condensate							CONDENSATE Combined Test Rate (bbls/d)	(bbls/ MMCF)
4. North Triumph	2	B-52	1986	12,992	27.5	27.5	150	5.4
		G-43	1985	14,777	37.0	72.2	360	5.0
5. West Olympia	1	0-51	1985	15,800	21.3[1]	21.3[1]	576[1]	27.0[1]
6. West Venture	1	C-62	1984	18,117	33.5	33.5	160	4.8
7. West Venture	1	N-91	1984	18,200	*	*	*	*
8. Chebucto	1	K-90	1984	17,175	22.1	44.5	324	7.3
9. Alma	2	K-85	1985	11,817	30.2	90.2	827	9.2
		F-67	1984	16,581	29.8	61.2	709	11.6
10. Uniacke	1	G-72	1984	18,816	20.6	26.6	150	5.6
11. Glenelg	3	E-58A	1984	13,753	23.4[2]	34.4[2]	387[2]	11.2[2]
		J-48	1983	16,890	30.0	92.4	640	6.9
12. Arcadia	1	J-16	1983	19,701	14.1	25.0	119	4.8
13. South Venture	1	0-59	1982	20,261	18.2	93.4	3,403	36.4
14. Olympia	1	A-12	1982	19,896	17.5	56.0	845	15.1
15. Banquereau	1	C-21	1982	16,375	19.9	20.7	100	4.8
16. Venture	5	H-22	1984	19,501	38.0	68.3	781	11.5
		B-52	1983	19,554	49.7	63.1	207	3.3
		B-43	1982	19,268	15.0	95.0	2,100	22.1
		B-13	1981	17,600	18.6	81.2	1,158	14.3
		D-23	1979	16,200	22.6	44.4	548	12.3
17. Intrepid	1	L-80	1974	13,651	7.6	18.1	191	10.5
18. Citnalta	1	I-59	1974	15,010	11.0	19.6	1,331	68.0
19. Thebaud	3	I-93	1985	16,949	28.8	35.4	849	24.0
		I-94	1978	12,997	13.7	13.7	404	29.5
		P-84	1972	13,500	10.6	30.0	103	3.4
20. Onondaga	4	E-84	1969	13,085	•	•	•	•

NOTE: MMCF/d — million cubic ft. per day

* Well control problems prevented tests from being run in this well.

• Not flow tested but mechanical logs indicated a good reservoir.

[1] These initial rates were tested but declined during testing.

[2] These initial rates were tested but declined during testing.

OFFSHORE

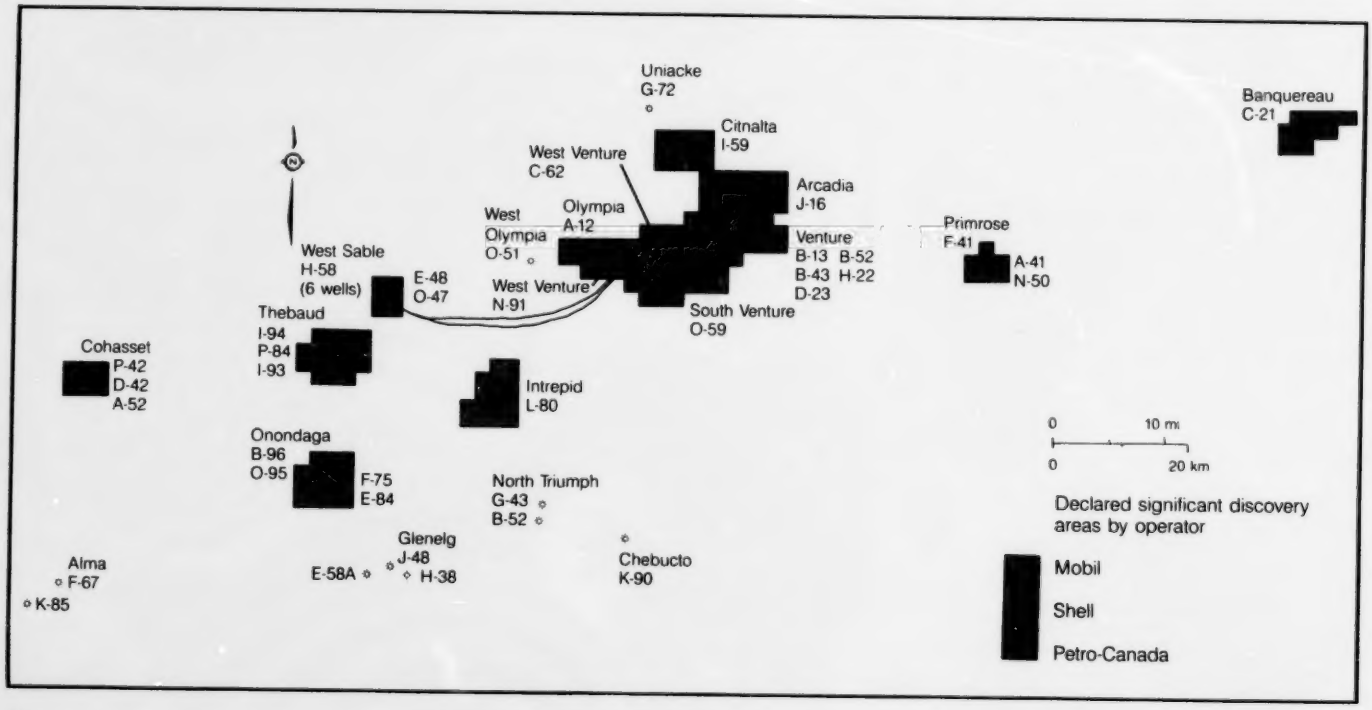
Two natural gas discoveries, North Triumph and West Olympia, were made during the past year and North Triumph was successfully delineated. One previously discovered natural gas structure, Thebaud, was also successfully delineated and a successful delineation well was drilled on Cohasset, an earlier oil discovery. The new discoveries have added significantly to the gas reserves in offshore Nova Scotia and have increased the potential for additional gas production.

The most recent resource estimates (1986) by the Canada Oil and Gas Lands Administration (COGLA) for offshore Nova Scotia (including the most recent North Triumph discovery) show 4.7 trillion cubic feet (133.1 billion m^3) of gas and 121 million barrels (19.2 million m^3) of oil and condensate (Figure 15). This represents a 50 percent increase in discovered gas resources since the Venture discovery in 1979. Oil resources (including condensate) increased more than 40 percent over those resources discovered prior to the Venture discovery.

NORTH TRIUMPH STRUCTURE

North Triumph G-43 (Shell and partners) was drilled to a depth of 14,777 feet (4 504 m) to test a new structure in close proximity to other significant gas discoveries at Glenelg, Alma, and Chebucto. The North Triumph structure is located 10 miles (16 km) northwest of the Chebucto K-90 gas field discovery well. The G-43 well, completed in February 1986,

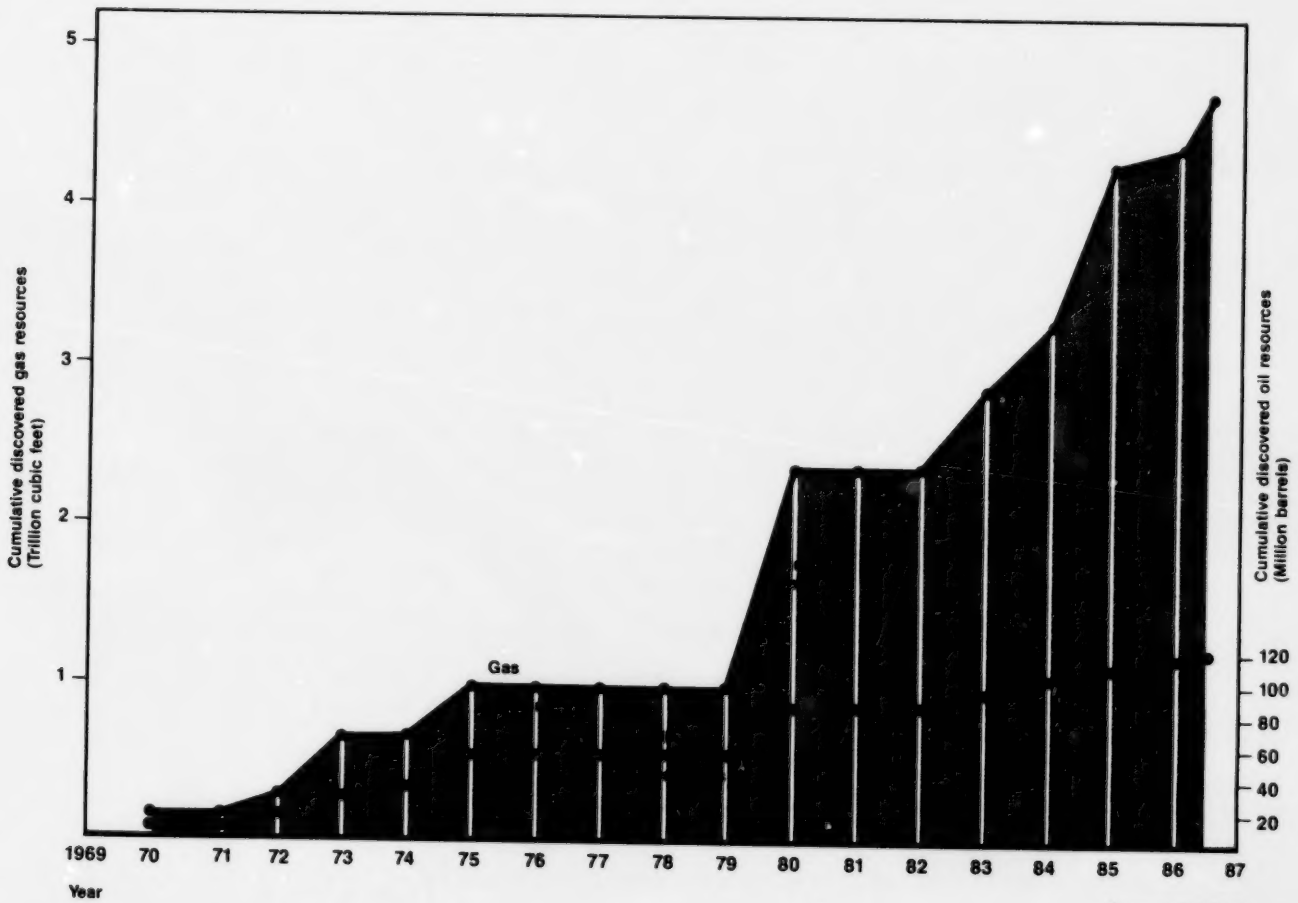
14 Discoveries Declared Significant by the Canada-Nova Scotia Offshore Oil & Gas Board



tested gas in two zones at rates 35.2 and 37.0 million cubic feet per day (996 758 and 1 047 729 m^3/d) from 12,582-12,618 feet (3 835-3 846 m) and 12,451-12,497 feet (3 795-3 809 m), respectively. Minor amounts of condensate were found. The total combined flow at North Triumph was the third highest achieved from a discovery well off Nova Scotia (next to Glenelg J-48 and South Venture 0-59).

The first delineation well, North Triumph B-52, was initiated on January 24, 1986, before the discovery well was completed. Located 1.9 miles (3 km) southwest of the North Triumph G-43 discovery well, the B-52 delineation well was drilled to a total depth of 12,992 feet (3 960 m) and tested gas with minor amounts of condensate at a rate of 27.5 million cubic feet per day (778 717 m^3/d) from the interval 12,372-12,392 feet (3 771-3 777 m). The B-52 well confirmed the occurrence of gas on the southwestern portion of the North Triumph structure.

15 Discovered Gas and Oil Resources Offshore Nova Scotia (1969-June 1986)



Source: COGLA

WEST OLYMPIA

Mobil and partners drilled West Olympia O-51 in the past year to test a separate structure just southwest of the Olympia A-12 gas discovery well. The West Olympia structure is located 5 miles (8 km) southwest of the Olympia A-12 gas discovery. O-51, completed to a depth of 15,800 feet (4 816 m) in November 1985, flowed natural gas at a rate of 21.3 million cubic feet (603 152 m^3/d) over the interval 14,291-14,390 feet (4 356-4 386 m) from one of two zones tested. The rate declined after 10.25 hours to 18.7 million cubic feet (529 528 m^3/d).

THEBAUD STRUCTURE

Mobil and partners completed a second delineation well, Thebaud I-93, on the Thebaud structure in September 1985. The structure is located 4 miles (6 km) southwest of the western tip of Sable Island and was first discovered in October 1972 (Thebaud P-84 discovery well). Mobil followed the discovery with the completion of the first delineation well (I-94) in May 1978. Thebaud I-93, located 1.9 miles (3 km) southwest of the 1972 discovery well and 1.2 miles (1.9 km) south of the successful I-94 appraisal well, was drilled to evaluate the potential of the southwest flank of the Thebaud structure. Drilled to a total depth of 16,949 feet (5 166 m), the well tested nine zones, two of which flowed gas. The highest test rate measured was 28.8 million cubic feet (815 530 m^3/d) in the 12,897-12,900 feet (3 931-3 932 m) zone. A third delineation well, Thebaud C-74, to evaluate the southeastern portion of the Thebaud structure, was underway in June 1986 and completion is expected in September 1986.

COHASSET

Petro-Canada and partners' Cohasset A-52 delineation well, completed in early 1986, recorded the highest combined flow rates of any oil well drilled off the East Coast of Canada. This was the third well and second delineation well drilled into the Cohasset structure. Earlier the Cohasset D-42 discovery well, drilled in 1973, had tested a combined flow rate of 1,565 barrels per day (249 m^3/d) of oil and a small amount of gas. An unsuccessful appraisal well, Cohasset P-42, was drilled 1.5 miles (2.4 km) to the northeast of the discovery well in 1978.

Cohasset A-52, situated 1.1 miles (1.8 km) southwest of the Cohasset D-42 discovery well, was completed in March 1986, to a total measured depth of 9,340 feet (2 847 m). Six individual tests were run on the well, resulting in a total combined flow of 29,200 barrels per day (4 642 m^3/d) of light oil (API gravity ranging from 48° to 54°) and 1.2 million cubic feet per day (33 980 m^3/d) of gas. The Cohasset A-52 well confirmed anticipated reserves and producing capacity of the individual sands encountered in the Cohasset structure. Technical evaluation of the well results is being carried out to confirm if the field can be brought into commercial production by a less costly system such as a converted drilling rig. The need for further delineation drilling to confirm the size of the structure has not yet been determined.

5 *OFFSHORE SAFETY*

SAFETY AND TRAINING

By its very nature, drilling in a hazardous offshore environment such as the Scotian Shelf requires a degree of emphasis on survival and safety that would not apply to onshore operations. Consequently considerable effort has been directed by the Nova Scotia Department of Mines and Energy and by the Federal Government towards evaluating and improving aspects of offshore safety.

Improvements in offshore safety and training require an ongoing effort and commitment by operators, drilling contractors, and service companies. A minimum requirement is that those working offshore receive sufficient training to be aware of the increased risks of working offshore and of the need to behave responsibly towards safety at all times. The Department of Mines and Energy, in co-operation with the Canada Oil and Gas Lands Administration (COGLA), regularly reviews and evaluates safety practises and capabilities of the Scotian Shelf operators. In recent years the Department has participated in joint industry/government groups and task forces to address conflicts and deficiencies in safety and training regulations. Committees dealing with safety topics such as Offshore Blowout Prevention, Well Control, Barge Control and Examination, H_2S Examination and Certification, and Minimum Standards for Mobile Drilling Units (MODU) Marine and Drilling Personnel Certification, all operate in the Province.

LIFE SAVING AND RESCUE EQUIPMENT

Survival equipment and launching systems have been continuously upgraded to enable operations in more severe sea and weather conditions. Research and development is ongoing to increase operational limits of these systems and enhance their survival capabilities.

A significant recent development in safety systems has been the industry-managed research and development program for a Preferred Orientation and Displacement Lifeboat Launching System (PROD). Phases I and II of the program, which led to tests of a system to prevent a medium-size lifeboat from striking a drilling unit's structure during launching, have been successfully completed. The Department of Mines and Energy participated in Phases I and II of the PROD Program and is involved in Phase III — the development and testing of a system to launch and recover large enclosed lifeboats in severe weather, which should be completed in 1986. A program has also been put in place to enhance the safety of transfer of personnel between drilling units and supply vessels.

Survival Systems

A combined training and practice session offshore Nova Scotia.

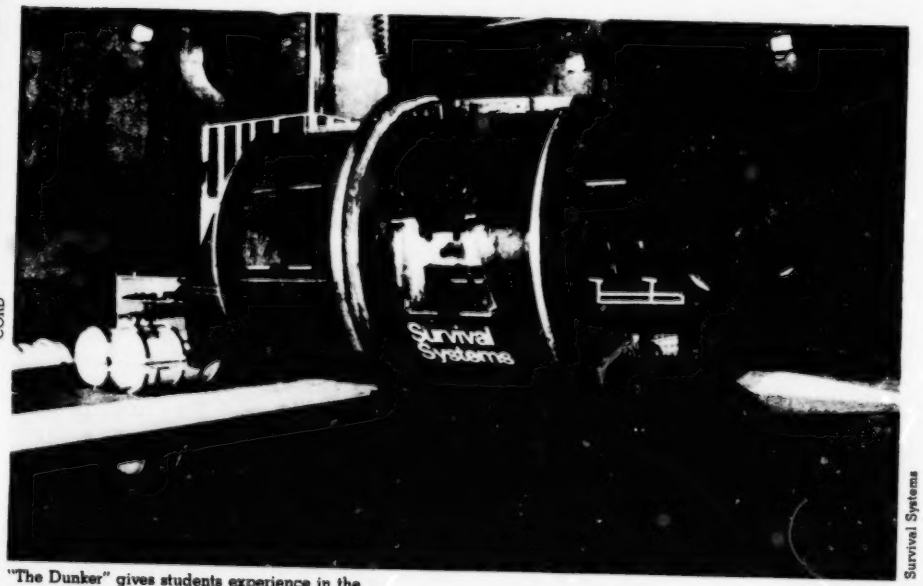
NOVA SCOTIA BASED TESTING AND TRAINING FACILITIES

Several businesses involved in safety and training are currently established in Nova Scotia. **Survival Systems Limited,** with offices and testing/training facilities located in the Woodside Ocean Industries Park, Dartmouth, has played a key role in the development of minimum standards for offshore survival training and emergency response procedures. The company provides both the petroleum industry and government supervisory bodies with safety and survival programs. The company's expertise has been called upon to write Emergency Response Manuals, to evaluate safety and survival appliances, equipment and procedures, as well as to co-ordinate exercises designed to test emergency preparedness.

The **Coordination and Organization Research and Development Group** (CORD), also based in Dartmouth, has conducted projects including the evaluation of thermal protection provided by immersion suits worn by the offshore rig workers travelling by helicopter to and from the rigs. The Thermal Manikin Test System has been adopted by CORD to measure minimum thermal requirements as specified in the Helicopter Passenger Transportation Suit System Standards (Canadian General Standards Board). Certification programs in accordance with this standard are currently being conducted.

CORD

Manikin used to test insulation qualities of the survival suits.



Survival Systems

"The Dunker" gives students experience in the sensations and routines involved in escaping from a downed helicopter at sea.

OFFSHORE DEVELOPMENT PROSPECTS

1 VENTURE GAS PROJECT

Significant progress has been made by Mobil and its partners on the Venture Gas Project, the first development project underway in the Nova Scotia offshore. The following significant events led to the current plans for development and production of gas and condensate from the Venture, Thebaud, and South Venture fields.

- 1972 — Discovery of the Thebaud Field
- 1979 — Discovery of the Venture Field
- 1982 — Discovery of the South Venture Field
- 1983 — Submission and review of the Socio-Economic Impact Statement (SEIS) and the Environmental Impact Statement (EIS) for the Venture Gas Project
- 1984 — Submission of the Preliminary Development Plan by Mobil and partners to the Canada-Nova Scotia Offshore Oil and Gas Board
- 1985 — Negotiation of Export Sales Contracts between Mobil and partners and two United States pipeline companies
  - — Filing of Mobil and partners' Export Application with the National Energy Board
  - — Submission of Import Application by NESP Supply Company, one of the two gas purchasers in the United States, to the Economic Regulatory Administration (ERA) in October 1985

The submission of an application to the U.S. Economic Regulatory Administration (ERA) by NESP Supply Corporation, to import Venture gas into the United States, is the first step in the United States regulatory process for approving import of offshore natural gas from Canada.

Drilling continued through the past year to establish additional reserves for the Venture Gas Project. Another gas-bearing structure, West Olympia, was discovered close to other significant discoveries in the Sable Island area. Mobil's Thebaud I-93 well was successful in further delineating the Thebaud gas field, while Thebaud C-74 is currently delineating the southeastern extent of the field.

As described in Mobil and partners' Export Application to the National Energy Board in July 1985, project facilities are being designed to develop the reserves of three fields: Venture, South Venture, and Thebaud. Mobil and partners' Export Application will be considered by the National Energy Board following confirmation of sufficient reserves.

2 SMALL OILFIELD DEVELOPMENT

Encouraging test results from the Cohasset A-52 delineation well, drilled in 1986 by Petro-Canada, Nova Scotia Resources Limited, and Canterra, have generated interest in commercial development of small oil fields off Nova Scotia. Due to the small size of the Cohasset field, innovative approaches to reduce costs and obtain early production are being investigated by participants. Concepts being considered include the use of existing jack-up drilling units with added production equipment to serve as production platforms, and the use of high volume pumping to increase the crude oil production rate with consequent improvements to project cashflow.

Prior to development, technical and economic feasibility studies will have to be undertaken and studies conducted to ensure that the project will be safe and environmentally acceptable.

3 FACTORS INFLUENCING OFFSHORE DEVELOPMENT

As activity in the Nova Scotia offshore moves from the exploration phase to the development phase, project proponents are carefully weighing a variety of factors in making their investment decisions. Clearly development will not proceed unless a reasonable rate of return can be foreseen for their investment. The stakes are high — the investment required could be considerable, running into billions of dollars.

The Venture Gas Project currently has all the basic prerequisites of a viable development. Some of these prerequisites are listed in general in Figure 16. It is generally agreed that sufficient reserves exist in offshore Nova Scotia to support a project. Markets large enough to support the costs of development exist in the Northeastern United States. Proven gas reserves in the United States are predicted to last only 11 years at present rates of consumption. There is a current market for new competitively priced gas in the Northeastern United States. The question for the future of the Venture project development, then, is not so much if it *will* be developed, but rather, *when*.

The *when* of the Venture Gas Project will depend on a detailed economic analysis. In such an analysis, the rate of return of the project is sensitive to a number of factors that can be loosely grouped as "Revenue", "Cost", and "Other" (Figure 16).

The factor of the greatest concern at present is the World Oil Price. Oil is an internationally traded commodity that competes with natural gas as a heating fuel and thus influences its price. The World Oil Price has fluctuated wildly in the last year, ranging from a high of $29 (U.S.) per barrel to a low of under $10 (U.S.) per barrel. The difficulty for proponents of projects like Venture and Hibernia lies not so much in assessing the current World Oil Price, but rather in anticipating the price at the time of first production, four to six years in the future. More critical still is the price during the 20- to 30-year producing life of the project. There is currently general agreement that despite present uncertainty in World Oil Price, the trend will be to higher prices. This is because OPEC nations have the majority of the world's oil reserves while non-OPEC reserves are rapidly depleting. OPEC will likely be in a dominant position in world markets as early as the 1990's, a situation which will lead to increased prices.

The economic situation at present is quite favorable to development and operation of offshore projects. The 1982/83 recession and recent fall in the World Oil Price led to reduced inflation and interest rates. Competition in downsized construction and offshore drilling markets has forced prices down, and Federal and Provincial governments have acknowledged the impact of lower World Oil Prices on the industry in their tax and royalty regimes.

A final factor in determining when development will proceed is the involvement of proponents in projects elsewhere. Most oil and gas companies operate not only in Canada but throughout the world. Companies rank their worldwide project investment opportunities and develop first those projects that produce the highest return, in those countries where the investment climate is most stable and hospitable.

16 Factors Influencing Offshore Development

Prerequisites

- Sufficient reserves to maintain production over the operating life of the project.
- Capability of the producing partners to finance the project.
- Markets for the end-product over the operating life of the project (as evidenced by sales contracts).
- Technical feasibility and environmental and social acceptability of the project.

Revenue Factor

- An acceptable price for the end-product (e.g., natural gas or crude oil) during the producing life of the project. This factor is heavily influenced by the world oil price.

Cost Factors

- Capital costs of the facilities constructed to develop the reserves.
- Cost of the development drilling to produce the reserves.
- Cost of taxes and royalties levied by governments.
- Interest rates on money borrowed to develop the project.

Other Factors

- The rate of return to the partners of other projects elsewhere in Canada and the world.
- Other government policies impacting on the investment climate where the project is to take place.

FRONTIER ENERGY POLICIES

1 THE CANADA-NOVA SCOTIA OFFSHORE PETROLEUM RESOURCES ACCORD

At the time of writing (late July 1986), agreement in principle had just been reached between the Governments of Canada and Nova Scotia concerning a new Offshore Accord. This Accord will replace the March 1982 Agreement concluded with the previous Federal Government and contains significant improvements to that Agreement. These improvements reflect the new Frontier Energy policies introduced by the Federal Government in 1985, while at the same time acknowledging the rights which Nova Scotia held under the previous Agreement.

Details of the Accord are not available at the time of writing, but it is expected that they will be announced in late August or early September 1986 and will include changes to the management, financial and promotional arrangements between the two Governments.

In conjunction with the profit-sensitive offshore royalty regime which Nova Scotia is proposing, it is felt that the new Accord will greatly assist the petroleum industry in planning their future exploration and development activities offshore Nova Scotia.

2 CANADA PETROLEUM RESOURCES ACT

On October 30, 1985, the Federal Minister of Energy, Mines and Resources, the Honourable Pat Carney, announced a new frontier energy policy. The policy introduced a new approach to petroleum exploration incentives and changes to the management and royalty regime affecting the energy industry. Together with the Western and Atlantic (Newfoundland) Accords, the new policy marked the end of the National Energy Program. Highlights of the new policy include the following:

- A proposed Canada Petroleum Resources Act will replace the 1981 Canada Oil and Gas Act.
- The Petroleum Incentive Payments (PIP) Grant System will be phased out by the end of 1987 and replaced by a refundable 25 percent Investment Tax Credit for exploration expenses above $5 million per well anywhere in Canada.
- The Crown Share, or 25 percent "back in" provision, held by the Federal Government for all interests in frontier lands will be abolished.
- Measures will be enacted to ensure that frontier oil and gas projects are at least 50 percent Canadian-owned.
- A federal royalty regime is proposed in which royalties are designed to be low during the early stages of production but to increase once the project payout point has been reached.
- A competitive bidding system for issuing exploration rights will be put in place.

ONSHORE EXPLORATION

1 GEOLOGICAL SETTING

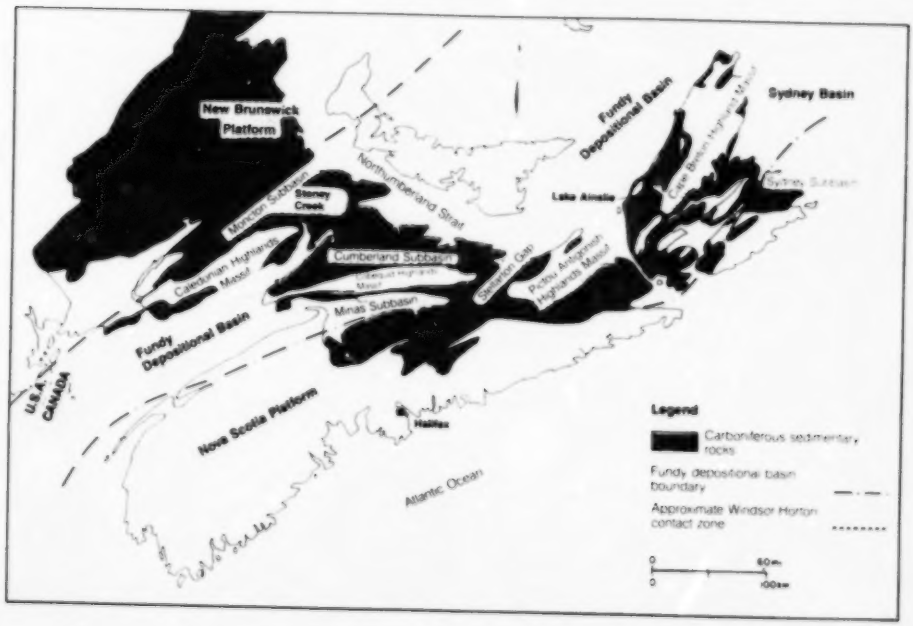
Most onshore petroleum exploration has concentrated on Carboniferous aged rocks. Exposures of these rocks occupy about one-third of the Province in several sedimentary basins, including the Minas Subbasin, Cumberland Subbasin, Stellarton Gap-Pictou Subbasin, Antigonish Subbasin, and Inverness-Mabou Subbasin (Figure 17).

The Carboniferous rocks were formed from sediments first deposited in narrow elongate basins bordered to the northwest by uplands in New Brunswick and to the south by an uplifted region of pre-Carboniferous rocks in Nova Scotia. The first sediments were deposited in the Fundy Depositional Basin and came from both bordering areas. These sediments form the Horton Group, and consist of red to grey sandstone, conglomerate, siltstone, and shale.

A commercial oil and gas field in Horton Group rocks in the Albert Formation of New Brunswick is currently producing from a section of the same regional Carboniferous basin which extends through much of Nova Scotia. The Stoney Creek field (Figure 17) in the Moncton Subbasin had produced 28 billion cubic feet (793 million m³) of gas and 800,000 barrels (127 000 m³) of oil between its discovery in 1909 and the end of 1985. In 1985, gas production at Stoney Creek was 75 million cubic feet (2.1 million m³) and oil production 3,961 barrels (630 m³).

Overlying the Horton Group strata are younger Carboniferous rocks of the Windsor Group, consisting of thick members of massive to poorly bedded red and greenish-grey mottled siltstone, shale and sandstone, interbedded with gypsum, anhydrite, shale and

17 *Carboniferous Age Sediments, Onshore Nova Scotia*



thin tabular sequences of limestone and dolomite. Thick salt deposits occur at a number of localities and have had a noticeable effect on deformation in some areas. Salt flowage in some of the basins accounts for salt diapirs, domes and ridges.

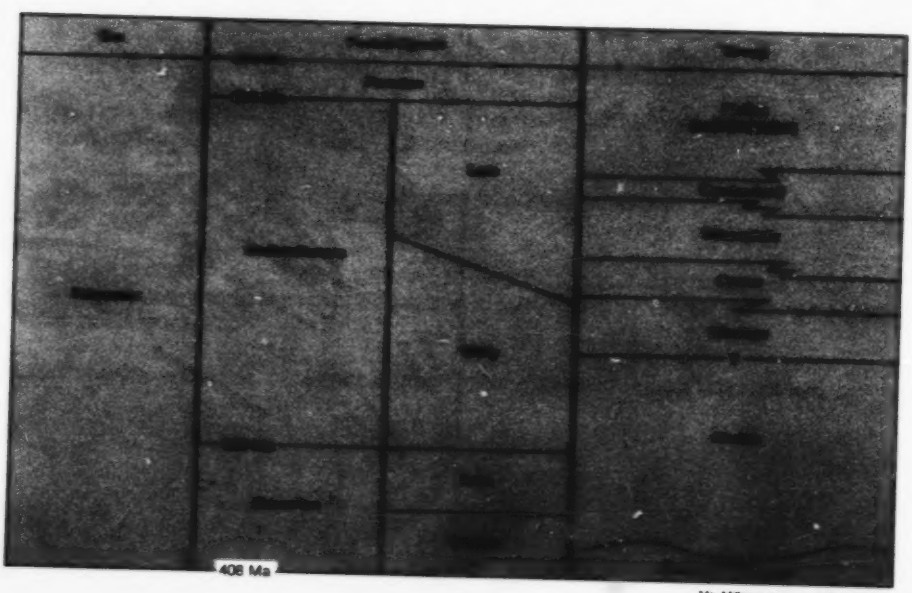
The Canso Group lies above the Windsor Group and contains mainly thinly laminated red and grey shales, sandstone and minor limestone. Deposited later were rocks of the Riversdale Group, thick deposits of coarse clastics (red and grey sandstone and shale), non-marine red and grey sandstone, siltstone, shale and coal.

The Cumberland Group of the Late Carboniferous contains appreciable amounts of coal. Rocks of the group lie over Carboniferous and older strata and include non-marine red and grey conglomerate, sandstone, shale and mineable coal seams.

During the deposition of the upper part of the Cumberland Group, non-marine fluvial and fluvio-lacustrine red and grey sandstones, shales and minor conglomerates of the Pictou Group were deposited in other areas. These Pictou sediments unconformably overlie older Paleozoic rocks and onlap the older metamorphic basement rocks. In the Late Carboniferous, swamps flourished and therefore thick coal deposits accumulated in a number of subbasins.

The potential for petroleum accumulations within Carboniferous rocks depends on the presence of organic rich source rocks and the migration and accumulation, within reservoir quality formations, of hydrocarbons generated from source rocks. Organic material of both marine and non-marine origin is found within the Carboniferous strata of Nova Scotia. In addition, a variety of potential geological hydrocarbon traps are found in the Province. These include traps related to salt movement, faulting, carbonate reefs, folding, porosity-permeability pinchouts, unconformities and stratigraphic changes.

18 Geological Time Scale



2 HISTORY

Drilling for petroleum in Hantsport, Nova Scotia 1902-1903

Widely scattered occurrences of oil and gas in Nova Scotia have been reported over the years. Surface occurrences in various parts of the Province were reported as far back as the middle of the last century when an oil seep was discovered on the shores of Lake Ainslie, Inverness County. Since then, 25 significant surface shows of petroleum have been reported and various hydrocarbon occurrences have been noted in wells and drillholes throughout the Province. These include significant petroleum shows in about one-third of the 97 petroleum wells drilled since 1869 and in at least 68 wells drilled for purposes other than petroleum exploration. The most recent show was in a water well drilled on the east side of Lake Ainslie in October 1985. All shows to date have occurred in Windsor Group rocks (marine origin) and in rocks in the non-marine Horton, Stellarton, and Pictou Groups (Figure 18).

After the Lake Ainslie Pioneer Oil & Salt Co. drilled the first recorded Nova Scotia well in the Mabou area near Lake Ainslie, Cape Breton Island, in 1869, onshore drilling activity reflected the excitement and interest in petroleum exploration prevalent in the rest of North America at the time. Twelve of the 19 wells drilled from 1869 until 1905 were concentrated in the Mabou-Lake Ainslie area where surface seepages of oil had been noted during the mid-1800's (Figure 19). The remaining seven wells were drilled near Chevene in Hants County and Stellarton in Pictou County, Nova Scotia.

Between 1899 and 1906, an extensive exploration program in southeastern New Brunswick resulted in the drilling of 72 wells and led to a commercial oil and gas discovery in 1909 at Stoney Creek, situated about 9 miles (14.5 km.) south of Moncton. The Stoney Creek discovery stimulated the drilling of seven wells centered in the Mabou-Lake Ainslie area of Nova Scotia between 1910 and 1915. This area and other parts of northern Nova Scotia lie within the same section of the regional Carboniferous basin as the Stoney Creek discovery.

From 1926 to 1930, Eastern Gulf Oil Company embarked on a 17-well diamond drilling program in Inverness County following encouraging field reconnaissance in this area. During the same period, Imperial Oil finished 10 wells in the Nappan area of Cumberland County. With the Depression of the 1930's came a significant decrease in exploration activity and only one well was drilled between 1931 and 1944.

On March 28, 1942, an "Act to Regulate the Search for Petroleum and Natural Gas" was enacted in Nova Scotia. Previously, petroleum resources were regulated, along with all other mineral resources in Nova Scotia, under the Mines Act.

Interest in petroleum revived in North America during World War II, a result of the loss of East Indian Oil Fields to the Japanese. Drilling activity increased between 1944 and 1949 when 13 wells were drilled in Nova Scotia by six operators.

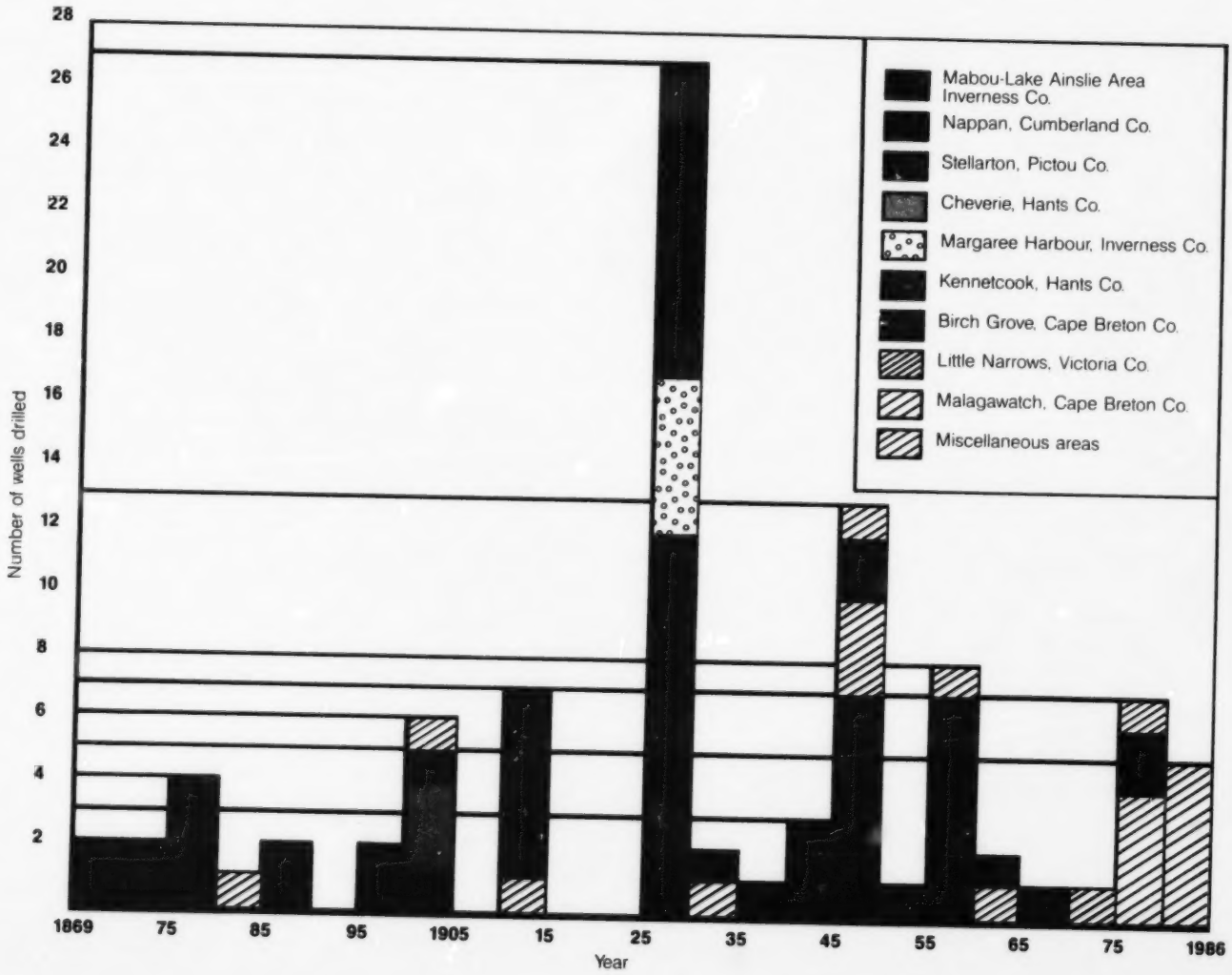
ONSHORE

In 1956, the Petroleum and Natural Gas Act was passed to guide exploration and production activities for onshore petroleum resources.

Drilling activity picked up in the late 1950's and continued at an increased level into the early 1960's. A major contributor to activity was Imperial Oil Limited, whose exploration program in the Mabou-Lake Ainslie area of Cape Breton accounted for 8 of the 10 wells drilled during this time.

Chevron Standard's oil show at the Malagawatch #1 well on Cape Breton Island in late 1979 was the highlight of four wells drilled between 1975 and 1980 by Chevron, and three other wells drilled by separate companies during the same period. In 1981 Chevron drilled the Scotsburn #2 well in the Scotsburn area.

19 Number of Onshore Wells Drilled by Area and Year, 1869-1986



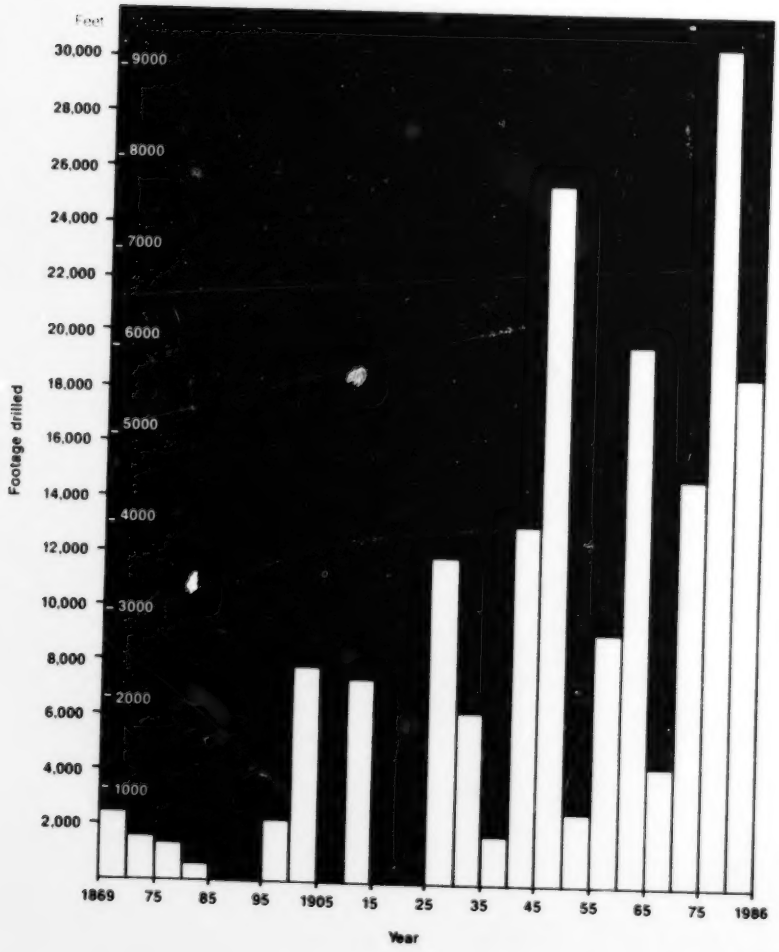
The last four wells drilled onshore, all in southwestern Cape Breton, were operated by Corkan Engineering of Canada Ltd. during the winter of 1983-84.

In July 1984, the new Petroleum Resources Act was proclaimed, replacing the Petroleum and Natural Gas Act (1956). Regulations pursuant to this new Act were brought into effect on October 30, 1985.

A total of 97 wells have been drilled onshore by at least 21 operators. By far the peak years for drilling activity were between 1925 and 1930 when a record 27 wells were drilled in the Province.

The total footage drilled was clearly greater after the 1940's (Figure 20) and strongly reflects the advancement in drilling technology and the deeper exploration plays of recent years.

20 Footage Drilled by Year, Onshore Nova Scotia, 1869-1986



3 PETROLEUM RESOURCES ACT

The Petroleum Resources Act (PRA) came into force on July 28, 1984. The Act and regulations made pursuant to it establish the legislative regime for exploration and production of petroleum, including oil, natural gas, and coal gas in the onshore area of Nova Scotia. The onshore area includes all of the Province except portions made subject to the Canada-Nova Scotia Offshore Petroleum Resources Accord.

The Act provides for three types of agreements in connection with exploration and production:

Exploration License — This grants a non-exclusive right to explore for petroleum. It has a term of one year and is intended to allow preliminary exploration to delineate areas of potential. The licensee may not drill a well deeper then 295 feet (90 m) and does not have the right to produce petroleum.

Exploration Agreement — This confers the exclusive right to explore for petroleum and the exclusive right to apply for a production lease in respect of certain lands. It is usually issued after a Call for Proposals has been held, and has a three-year term. An exploration agreement permits the agreement holder to drill deep test wells and to produce petroleum for test purposes only. Annual rentals of $0.05/acre ($0.12/ha) are payable to the Province.

Production Lease — If a commercial discovery is made and the explorer submits a development plan which is approved by the Minister, a production lease will be issued for an initial term of 10 years. A production lease grants the lessee the right to produce petroleum from the leased area and to market that petroleum in accordance with the regulations. All petroleum marketed is subject to a 10 percent royalty payable by the lessee to the Province. However, the first lease granted from any exploration agreement is exempt from this royalty for the first two years.

4 ONSHORE ACTIVITY

The proclamation of the Petroleum Resources Act in July 1984, was followed by promulgation of the Act's regulations on October 30, 1985. Companies with rights under the repealed Petroleum and Natural Gas Act had six months from that date to negotiate exploration agreements for new lands. Discussions were held between the Department of Mines and Energy and proponents until April 30, 1986, at which time exploration agreements (E.A.'s) were concluded with former onshore license holders. Two-thirds of the land previously held has been retained under these renegotiated exploration agreements (Figure 21).

Chevron Canada Resources Limited and Irving Oil Limited continue to have the largest land holdings (Figure 22). Two E.A.'s, one in Cumberland County and the other in the Lake Ainslie area of Cape Breton Island, cover a total of 4.0 million acres (1.6 million ha). Sigma Resources, Inc. renegotiated an E.A. on 371,618 acres (150 394 ha) in the Amherst-Minas Basin area. The Province's fourth E.A. was renegotiated by Miles Co. on 315,468 acres (127 670 ha) in southeastern Cape Breton and on the eastern mainland of Nova Scotia. A new application for onshore lands is currently being negotiated and may lead to another exploration agreement.

21 Summary of Onshore Oil and Gas Rights Holders

Former Licencees	Area Formerly held under License (acres)	Renegotiated Area (acres)	No. of E.A.'s Renegotiated	Rentals Paid
Chevron Canada Resources Limited	4,245,209		2	$195,975.95
Cumberland		2,581,171*		
Cape Breton		1,453,998		
TOTAL		4,035,169		
Sigma Resources Inc.	957,924	371,618	1	18,287.28
Tricentrol Oils Ltd.	423,825	—		—
Acadia Mineral Ventures (MEX Exploration)	249,239	—		—
Hughes	459,340	—		—
Noval Technologies	23,039	—		—
Win-Eldrich	24,759	—		—
Marchant	182,409	—		—
Miles	339,721	315,468*	1	15,320.42
TOTAL	6,905,465	4,722,255	4	$229,583.65

*includes additional lands applied for which will be incorporated into the renegotiated E.A.

ONSHORE

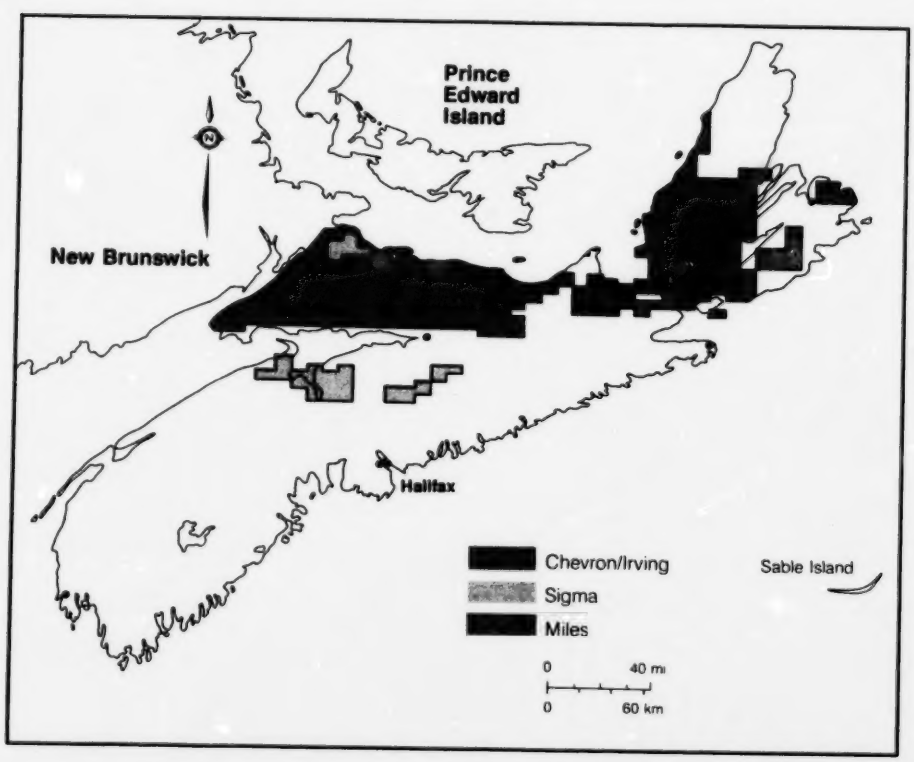
All four of the current exploration agreements have been renegotiated with the following terms and conditions:

- Exploration agreements have a three-year term.
- Each company entering into an exploration agreement agrees to undertake a work program,which includes drilling of at least one well during the term of the agreement and results in total exploration expenditures greater than $1.62 per acre ($4.00/ha).
- Rentals of $0.05 per acre ($0.12/ha) are to be paid annually.
- If the terms of the E.A. are fulfilled, the exploration company has the right to negotiate a subsequent three-year exploration agreement.

Based on the E.A.'s currently in place, $230,000 in rentals will accrue during 1986.

Other promising lands are now available in onshore Nova Scotia on which petroleum exploration can occur.

22 *Onshore Exploration Agreements Negotiated*



APPENDICES

1 DIRECTORY OF OFFSHORE WELLS

The wells are arranged by "Spud Date".
Data current to July 1, 1986.

ABBREVIATIONS

RT	Rotary Table
KB	Kelly Bushing
GL	Ground Level
P & A	Plugged and Abandoned
P & S	Plugged and Suspended
TD	Total Depth
TS	Temporarily Suspended

WELL SYMBOLS

- Drilling
- Temporarily Suspended
- Plugged and Abandoned
- Significant Gas
- Gas Show
- Significant Oil
- Oil Show
- Significant Oil and Gas
- Oil and Gas Show

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS
Mobile Sable Island C-67	43° 56' 04.9" 59° 55' 01.4"	Bawden Rig 18	67-06-07 68-01-02	26.9 (8.2) KB 12.8 (3.9) GL	15,106 (4604.3) P & A
Shell Onondaga E-84	43° 43' 16.14" 60° 13' 17.41"	Sedneth 1	69-09-01 69-11-11	85 (25.9) 190 (57.9)	13,085 (3988.3) P & A
Shell Oneida O-25	43° 14' 57.36" 61° 33' 36.49"	Sedneth 1	69-11-16 70-02-10	85 (25.9) 270 (82.3)	13,516.7 (4119.9) P & A
Shell Naskapi N-30	43° 29' 46.78" 62° 33' 59.54"	Sedneth 1	70-02-16 70-03-19	85.3 (26) 312 (95.1)	7,235 (2205.2) P & A
Shell Mic Mac J-77	44° 36' 42.81" 59° 26' 10.86"	Sedneth 1	70-03-25 70-05-24	85.3 (26) 206 (62.8)	12,750 (3886.2) P & A
Shell Mohawk B-93	42° 42' 10.52" 64° 43' 53.50"	Sedco H	70-05-03 70-05-23	103 (31.4) 383.9 (117)	6,975 (2126) P & A
Shell Missisauga H-54	44° 23' 20.39" 59° 22' 47.56"	Sedneth 1	70-05-26 70-07-20	85 (25.9) 335 (102.1)	13,787 (4202.3) P & A
Shell Abenaki L-57	44° 16' 34.49" 59° 53' 39.64"	Sedco H	70-05-28 70-07-06	103 (31.4) 359 (108.8)	7,147 (2178.4) P & A
Shell Onondaga O-95	43° 44' 48.09" 60° 13' 52.60"	Sedco H	70-07-09 70-08-16	103 (31.4) 176.8 (53.9)	10,874 (3314.4) P & A
Shell Huron P-96	44° 35' 47.10" 58° 28' 50.63"	Sedneth 1	70-07-22 70-08-27	85 (25.9) 190 (57.9)	9,903 (3018.4) P & A
Shell Iroquois J-17	44° 26' 31.37" 59° 47' 12.28"	Sedco H	70-08-18 70-09-06	103 (31.4) 194.9 (59.4)	6,845 (2086.4) P & A
Shell Mic Mac H-86	44° 35' 27.71" 59° 27' 03.12"	Sedneth 1	70-08-31 70-12-02	85 (25.9) 178.1 (54.3)	15,700 (4785.4) P & A
Shell Cree E-35	43° 44' 20.70" 60° 35' 55.89"	Sedco H	70-09-08 70-11-03	103 (31.4) 174.9 (53.3)	13,070 (3983.7) P & A
Shell Wyandot E-53	44° 52' 20.70" 59° 23' 54.05"	Sedco H	70-11-07 70-12-14	103 (31.4) 397 (121)	10,005 (3049.5) P & A
Shell Abenaki J-56	44° 15' 44.95" 59° 53' 03.22"	Sedneth 1	70-12-04 71-03-13	85 (25.9) 350 (106.7)	14,991 (4569.3) P & A
Shell Argo F-38	45° 27' 23.22" 58° 50' 24.34"	Sedco H	70-12-17 71-02-19	103 (31.4) 234.9 (71.6)	11,110 (3386.3) P & A
Shell Fox I-22	45° 21' 33.60" 59° 33' 16.00"	Sedco H	71-02-20 71-03-03	103 (31.4) 274.9 (83.8)	2,722 (829.7) P & A
Mobil-Tetco Esperanto K-78	44° 47' 31.26" 58° 11' 19.24"	Sedco H	71-03-09 71-04-24	103 (31.4) 225.1 (68.6)	11,615 (3540.3) P & A
Shell Erie D-26	44° 55' 03.52" 59° 34' 29.82"	Sedneth 1	71-03-16 71-04-11	85 (25.9) 321.9 (98.1)	7,795 (2375.9) P & A
Shell Crow F-52	45° 21' 24.23" 59° 08' 22.73"	Sedneth 1	71-04-12 71-04-27	85 (25.9) 310 (94.5)	4,943 (1506.6) P & A

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS	
Mobil-Tetco Dauntless D-35	44° 44' 08.26" 57° 20' 46.62"	Sedco H	71-04-26 71-07-16	103 (31.4) 227 (69.2)	15,555 (4741.2) P & A	
Shell Sauk A-57	44° 16' 05.70" 58° 37' 44.41"	Sedneth 1	71-04-30 71-07-10	85 (25.9) 196.9 (60)	15,010 (4575) P & A	
Mobil-Tetco Sable Island E-48	43° 57' 20.35" 60° 07' 24.44"	Bawden Rig 14	71-05-28 71-10-15	21 (6.4) 0 (0)	11,820 (3602.7) P & A	
Shell Chippewa L-75	44° 34' 35.87" 58° 41' 50.54"	Sedneth 1	71-07-12 71-08-12	81 (24.7) 222.1 (67.7)	6,975 (2125.9) P & A	
Shell Onondaga F-75	43° 44' 17.84" 60° 11' 36.25"	Sedco H	71-07-28 71-09-07	103 (31.4) 185 (56.4)	12,765 (3890.8) P & A	
Shell Triumph P-50	43° 39' 51.62" 50° 51' 02.36"	Sedneth 1	71-08-04 71-10-10	85 (25.9) 295.9 (90.2)	15,077 (4595.4) P & A	
Shell Eurydice P-36	45° 25' 47.30" 60° 04' 46.97"	Sedco H	71-09-15 71-10-24	98.1 (29.9) 540 (164.6)	9,728 (2965.1) P & A	
Shell Chippewa G-67	44° 36' 20.50" 58° 39' 44.62"	Sedco H	71-10-28 71-12-18	98.1 (29.9) 230 (70.1)	12,040 (3669.8) P & A	
Mobil-Tetco Sable Island 0-47	43° 56' 56.70" 60° 06' 38.08"	Bawden Rig 14	71-12-13 72-07-01	23 (7) KB 5.9 (1.8) GL	13,775 (4198.6) P & S	
Shell Mohican I-100	42° 59' 39.04" 62° 28' 51.32"	Sedco H	71-12-27 72-03-10	98.1 (29.9) 503 (153.3)	14,414 (4393.4) P & A	
Shell Marmora C-34	43° 43' 13.79" 60° 05' 21.93"	Sedneth 1	72-01-15 72-03-31	85 (25.9) 189 (57.6)	13,248 (4037.9) P & A	
Shell Primrose N-50	43° 59' 48.43" 59° 06' 51.63"	Sedco H	72-03-14 72-04-21	98.1 (29.9) 298 (90.8)	5,622 (1713.6) P & A	
Shell-Mobil-Tetco Eagle D-21	43° 50' 06.73" 59° 34' 09.21"	Sedco H	72-04-22 72-07-02	98.1 (29.9) 168 (51.2)	15,290 (4660.4) P & A	
Mobil-Tetco Sable Island I-H-58	43° 57' 27" 60° 07' 37"	Bawden Rig 9	72-06-03 72-08-27	35.1 (10.7) KB 5.9 (1.8) GL	9,971 (3039.2) P & S	
Mobil-Tetco-Thebaud P-84	43° 53' 59.53" 60° 12' 19.34"	Sedco H	72-07-08 72-10-13	93.8 (28.6) 85 (25.9)	13,500 (4114.8) P & S	
Mobil-Tetco Sable Island 2-H-58	43° 57' 27.14" 60° 07' 37.73"	Bawden Rig 9	72-10-06 72-12-31	34.8 (10.6) KB 5.9 (1.8) GL	9,050 (2758.4) P & S	
Shell Primrose A-41	44° 00' 05.68" 59° 06' 18.26"	Sedco H	72-10-15 73-01-27	98.1 (29.9) 359.9 (109.7)	11,865 (3616.5) P & A	
Mobil-Tetco Sable Island 3-H-58	43° 57' 27.20" 60° 07' 37.80"	Bawden Rig 9	73-01-01 73-03-21	34.8 (10.6) KB 5.9 (1.8) GL	12,270 (3739.9) P & S	
Mobil-Tetco Bluenose G-47	44° 06' 20.79" 59° 21' 27.35"	Sedco J	73-01-25 73-04-25	98.1 (29.9) 267.1 (81.4)	15,050 (4587.2) P & A	
Shell Primrose F-41	44° 00' 29.55" 59° 07' 06.52"	Sedco H	73-01-30 73-03-05	98.1 (29.9) 225.1 (68.6)	8,505 (2592.3) P & S	
Shell Marmora P-35	43° 44' 59.36" 60° 04' 47.58"	Sedco H	73-03-06 73-04-21	98.1 (29.9) 174.9 (53.3)	13,428 (4092.9) P & A	
Mobil-Tetco Sable Island 4-H-58	43° 57' 27.20" 60° 07' 37.80"	Bawden Rig 9	73-03-22 73-08-11	34.8 (10.6) KB 5.9 (1.8) GL	14,827 (4519.3) P & S	
Shell Tuscarora D-61	44° 40' 10.35" 58° 55' 10.85"	Sedco H	73-04-23 73-06-02	98.1 (29.9) 258.9 (78.9)	12,925 (3939.5) P & A	
Mobil-Tetco Cohasset D-42	43° 51' 06.52" 60° 37' 13.89"	Sedco J	73-04-27 73-07-16	103 (31.4) 135 (41.1)	14,525 (4427.2) P & S	
Shell Amoco Cap Rouge F-52	47° 11' 20.29" 61° 08' 15.32"	Sedco H	73-06-08 73-09-03	102 (31.1) 186 (56.7)	16,182 (4932.3) P & A	
Mobil-Tetco Sable Island 5-H-58	43° 57' 27.20" 60° 57' 37.80"	Bawden Rig 9	73-08-15 73-09-18	34.8 (10.6) KB 5.9 (1.8) GL	8,130 (2478) P & A	
Mobil-Tetco Sable Island 6-H-58	43° 57' 27.20" 60° 07' 37.80"	Bawden Rig 9	73-09-22 73-10-18	34.8 (10.6) KB 5.9 (1.8) GL	7,727 (2355.2) P & A	
Union et al Shell Ojibwa E-07	43° 46' 20.44" 61° 46' 14.42"	Sedco H	74-02-04 74-02-28	98.1 (29.9) 248 (75.6)	7,643 (2329.6) P & A	
Mobil-Tetco-Texaco Citnalta I-59	44° 08' 42.58" 59° 37' 32.11"	Sedco J	74-02-04 74-04-29	98.1 (29.9) 310 (94.5)	15,010 (4575) P & A	
Shell Demascota G-32	43° 41' 27.20" 60° 49' 54.00"	Sedco H	74-03-01 74-05-20	98.1 (29.9) 178.1 (54.3)	15,329 (4672.3) P & A	
Texaco-Shell Intrepid L-80	43° 49' 35.78" 59° 56' 43.82"	Sedco J	74-05-18 74-08-15	103 (31.4) 143 (43.6)	13,655 (4162) P & A	

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS	
Union et al Sambro I-29	43° 38' 35.04" 62° 48' 17.04"	Sedco H	74-05-23 74-06-27	98.1 (29.9) 634.8 (193.5)	10,071 (3069.6) P & A	
Union et al Jason C-20	45° 29' 05.45" 58° 32' 28.27"	Sedco H	74-07-03 74-07-22	98.1 (29.9) 370.1 (112.8)	8,146 (2482.9) P & A	
Union et al Hercules G-15	45° 34' 20.65" 58° 47' 13.06"	Sedco H	74-07-23 74-08-01	98.1 (29.9) 379.9 (115.8)	3,547 (1081.1) P & A	
Murphy et al North Sydney P-05	46° 34' 46.24" 59° 45' 01.65"	Sedco H	74-08-10 74-09-07	98.1 (29.9) 206 (62.8)	5,449 (1660.9) P & A	
Union et al Montagnais I-94	42° 53' 40.71" 64° 13' 46.51"	Sedco H	74-09-12 74-09-29	98.1 (29.9) 370.1 (112.8)	5,400 (1645.9) P & A	
Mobil-Tetco-Gulf Adventure F-80	45° 19' 27.54" 57° 56' 22.80"	Sedco J	75-01-13 75-02-22	98.1 (29.9) 324.1 (98.9)	6,559 (1999.2) P & A	
Mobil-Texaco Sachem D-76	44° 35' 09.22" 57° 41' 58.29"	Sedco J	75-05-17 75-07-30	98.1 (29.9) 191.9 (58.5)	16,006 (4878.6) P & A	
Shell Onondaga B-96	43° 45' 08.23" 60° 14' 09.63"	Sedco H	76-01-12 76-03-21	98.1 (29.9) 198.2 (60.4)	12,328 (3757.6) P & A	
Petro-Canada Shell Mic Mac D-89	44° 38' 08.86" 59° 28' 18.93"	Sedco H	76-03-26 76-05-04	98.1 (29.9) 279.9 (85.3)	10,552 (3216.4) P & A	
Petro Canada Mobil Hesper I-52	44° 41' 40.33" 57° 52' 32.24"	Sedco H	76-05-08 76-06-05	98.1 (29.9) 138.1 (42.1)	9,200 (2804.2) P & A	
Shell et al North Sydney F-24	46° 33' 23.12" 59° 48' 45.47"	Sedco H	76-06-09 76-06-14	98.1 (29.9) 195.9 (59.7)	5,600 (1706.8) P & A	
Petro Canada-Shell Penobscot L-30	44° 09' 43.55" 60° 04' 09.33"	Sedco H	76-07-18 76-09-23	98.1 (29.9) 451.1 (137.5)	14,000 (4267.2) P & A	
Petro-Canada-Shell Wenonah J-75	43° 34' 34.43" 60° 26' 13.72"	Sedco H	76-09-26 76-11-15	98.1 (29.9) 218.8 (66.7)	12,040 (3669.8) P & A	
Petro-Canada-Shell Moheida P-15	43° 04' 56.31" 62° 16' 44.32	Sedco H	76-11-18 77-02-15	98.1 (29.9) 367.1 (111.9)	14,100 (4297.7) P & A	
Shell-Petro-Canada Penobscot B-41	44° 10' 02.44" 60° 06' 34.50"	Sedco H	77-02-18 77-03-30	98.1 (29.9) 386.8 (117.9)	11,300 (3444.2) P & A	
Mobil-Tetco-PEX Migrant N-20	43° 59' 56.24" 60° 17' 18.23"	Gulftide	77-07-29 78-01-23	85.6 (26.1) 44.9 (13.7)	15,317 (4668.7) P & A	
Mobil-Tetco-PEX Thebaud I-94	43° 53' 43.67" 60° 13' 38.13"	Gulftide	78-02-26 78-06-03	98.1 (29.9) 91.9 (28)	13,000 (3962.3) P & A	
Chevron-PEX Shell Acadia K-62	42° 51' 42.54" 61° 55' 00.21"	Ben Ocean Lancer	78-04-11 78-08-02	42 (12.8) 2841.9 (866.2)	17,343 (5286.1) P & A	
Mobil-Tetco-PEX Cohasset P-42	43° 51' 48.23" 60° 36' 16.62"	Gulftide	78-06-09 78-07-10	100.1 (30.5) 111.9 (34.1)	8,500 (2590.8) P & A	
Mobil-Tetco-PEX Cohasset L-97	43° 56' 37.19" 60° 29' 58.55"	Gulftide	78-07-13 78-11-13	100.1 (30.5) 70.9 (21.6)	15,984 (4871.9) P & A	
Mobil-Texaco-PEX Venture D-23	44° 02' 15.00" 59° 34' 21.00"	Gulftide	78-11-28 79-06-16	104 (31.7) 65.9 (20.1)	16,224 (4945) P & S	
Mobil et al Venture B-13	44° 02' 11.61" 59° 32' 03.54"	Rowan Juneau	80-08-17 81-06-06	110.9 (33.8) 81 (24.7)	17,100 (5212) P & S	
Mobil et al Venture B-43	44° 01' 45.01" 59° 37' 21.03"	Rowan Juneau	81-07-06 82-04-25	110.9 (33.8) 66.9 (20.4)	19,265 (5872) P & S	
Petro-Canada et al Banquereau C-21	44° 10' 07.52" 58° 34' 00.24"	Bow Drill 1	81-12-02 82-08-01	88.6 (27) 272.3 (83)	16,375 (4991) P & S	
Mobil et al Olympia A-12	44° 01' 03.27" 59° 46' 44.09"	Zapata Scotian	82-04-23 83-01-10	125 (38.1) 130.9 (39.9)	19,895 (6064) P & S	
Mobil et al South Venture 0-59	43° 58' 52.83" 59° 38' 08.49"	Rowan Juneau	82-04-29 83-01-02	116.1 (35.4) 80.1 (24.4)	20,262 (6176) P & S	
Petro-Canada et al Banquereau I-13	44° 12' 33.16" 58° 31' 49.38"	Bow Drill 1	82-08-02 82-12-27	88.6 (27.0) 319.2 (97.3)	17,021 (5188) P & A	
Petro-Canada et al West Esperanto B-78	44° 47' 03.40" 58° 26' 11.22"	SDS Vinland	82-08-22 83-05-05	76.4 (23.3) 298.9 (91.1)	18,711 (5703) P & A	
Shell et al Shubenacadie H-100	42° 49' 28.43" 61° 28' 42.81"	Sedco 709	82-11-05 83-02-12	79.1 (24.1) 4,839.2 (1475)	13,780 (4200) P & A	
Mobil et al Bluenose 2G-47	44° 06' 22.30" 59° 21' 23.05"	John Shaw	82-12-30 83-09-05	80.1 (24.4) 279.9 (85.3)	19,019 (5797) P & A	

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS	
Mobil et al Venture B-52	44° 01' 12.88" 59° 38' 07.76"	Rowan Juneau	83-01-19 83-10-27	111.5 (34) 65 (19.5)	19,554 (5960) P & A	
Mobil et al Arcadia J-16	44° 05' 43.58" 59° 31' 58.19"	Zapata Scotian	83-01-27 83-07-19	125 (38.1) 182.1 (55.5)	19,701 (6005) P & S	
Petro-Canada et al S.W. Banquereau F-34	44° 03' 15.63" 58° 50' 21.60"	Bow Drill 1	83-02-20 83-08-30	81.7 (24.9) 373 (113.7)	20,699 (6309) P & A	
Shell-Petro-Can et al Glenelg J-48	43° 37' 39.00" 60° 06' 25.44"	Sedco 709	83-02-22 83-11-07	78.7 (24) 274.6 (83.7)	16,890 (5148) P & A	
Shell-Petro-Can et al Uniacke G-72	44° 11' 29.17" 59° 41' 09.75"	SDS Vinland	83-05-09 84-04-04	77.1 (23.5) 501.6 (152.9)	18,816 (5735) P & A	
Mobil et al Venture H-22	44° 01' 24.10" 59° 33' 06.10"	Zapata Scotian	83-07-26 84-04-16	125 (38.1) 78.7 (24)	19,501 (5944) P & S	
Husky/Bow Valley et al Glooscap C-63	43° 12' 09.85" 62° 09' 56.73"	Bow Drill 2	83-08-07 84-01-03	75.1 (22.9) 324.8 (99)	14,902 (4542) P & A	
Petro-Canada et al St. Paul P-91	47° 10' 57.88" 60° 13' 36.83"	Bow Drill 1	83-09-02 83-12-31	91.7 (24.9) 570.5 (173.9)	9,465 (2885) P & A	
Home et al Louisbourg J-47	44° 26' 43.08" 58° 21' 26.02"	Glomar Labrador 1	83-11-25 84-10-13	125.3 (38.2) 207 (63.1)	19,826 (6043) P & A	
Shell-Petro-Can et al Alma F-67	43° 36' 18.49" 60° 39' 56.49"	Sedco 709	83-12-02 84-07-05	78.7 (24) 155.7 (68)	16,581 (5054) P & S	
Husky/Bow Valley Chebucto K-90	43° 39' 44.74" 59° 42' 52.05"	Bow Drill 2	84-01-06 84-08-02	74.8 (22.8) 357.6 (109)	17,175 (5235) P & A	
Husky/Bow Valley et al South Griffin J-13	44° 22' 39.89" 58° 01' 55.20"	Rowan Gorilla 1	84-01-08 84-08-20	129.9 (39.6) 208 (63.4)	19,393 (5911) P & A	
Petro-Canada et al Bonnet P-23	42° 22' 48.64" 65° 03' 01.89"	Bow Drill 1	84-01-14 84-04-04	82 (25) 438 (133.5)	14,226 (4336) P & A	
Husky/Bow Valley Evangeline H-98 (Re-entered Well)	43° 17' 26.85" 60° 58' 50.60"	Bow Drill 3 Bow Drill 2	84-03-27 84-06-16 84-08-08 84-11-01	70.9 (21.6) 570.9 (174) 73.8 (22.5) 570.9 (174)	11,040 (3365) 16,549 (5044) P & A	
Shell-Petro-Can et al South Desbarres O-76	44° 05' 56.07" 59° 58' 58.02"	SDS Vinland	84-04-17 84-10-13	77.8 (23.7) 226.4 (69)	19,813 (6039) P & A	
Petro-Can et al Dover A-43	44° 22' 09.02" 60° 06' 09.28"	Bow Drill 1	84-04-17 84-07-10	82 (25) 380.6 (116)	14,846 (4525) P & A	
Mobil et al West Venture N-91	44° 00' 45.82" 59° 44' 27.33"	Zapata Scotian	84-04-19 85-07-07	128.9 (39.3) 125 (38.1)	18,199 (5547) P & A	
Mobil et al West Venture C-62	44° 01' 02.78" 59° 40' 00.25"	Rowan Juneau	84-05-19 85-03-23	110.9 (33.8) 54.1 (16.5)	18,117 (5522) P & A	
Shell PCI et al Glenelg E-58 and E-58A*	43° 37' 17.20" 60° 08' 56.10"	Sedco 709	84-07-07 84-10-20	78.7 (24) 259.2 (79)	13,753 (4192) P & A	
Bow Valley/Husky et al Hesper P-52	44° 41' 50.95" 57° 52' 47.72"	Rowan Gorilla 1	84-08-22 85-05-01	132.9 (40.5) 146 (44.5)	15,632 (5679) P & A	
Mobil et al West Venture B-92	44° 01' 08.51" 59° 43' 59.68"	Glomar Labrador 1	84-10-24 84-12-13	121.4 (37) 137.8 (42)	2,369 (722) P & A	
Shell Petro-Can et al Glenelg H-38	43° 37' 19.33" 60° 04' 48.61"	Sedco 709	84-10-26 85-01-26	79.1 (24.1) 293 (89.3)	15,961 (4865) P & A	
Petro-Can Texaco et al Albatross B-13	42° 41' 10.67" 63° 02' 11.83"	Sedco 710	84-12-12 85-03-28	78.7 (24) 4,399.6 (1341)	13,274 (4046) P & A	
Home Oil et al Citadel H-52	44° 11' 25.07" 58° 52' 39.87"	Glomar Labrador 1	84-12-18 85-05-31	125.7 (38.3) 214.2 (65.3)	18,589 (5666) P & A	
Mobil et al West Venture N-01	44° 00' 58.80" 59° 45' 51.69"	Rowan Gorilla 3	85-01-20 85-06-30	12.5 (38.1) 131.6 (40.1)	11,916 (3632) P & A	
Shell PCI et al Alma K-85	43° 34' 44.6" 60° 43' 01.7"	Sedco 709	85-01-29 85-04-10	78.7 (24) 223.1 (68)	11,818 (3602) P & A	
Mobil et al Thebaud I-93	43° 52' 44.4" 60° 13' 50.9"	Rowan Juneau	85-03-27 85-09-30	121.4 (37) 102 (31)	16,949 (5166) P & A	

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS	
Petro-Can et al Shelburne G-29	42° 38' 26.87" 63° 33' 33.46"	Sedco 710	85-03-31 85-04-06	82 (25) 3,684.4 (1123)	13,140 (4005) P & A	✣
Shell PCI et al Peskowesk A-99	44° 28' 13.84" 58° 58' 40.98"	Sedco 706	85-04-22 85-06-13	90.2 (27.5) 203.4 (62)	13,202 (4024) P & A	✣
Shell PCI et al Kegeshook G-67	44° 06' 32.69" 60° 24' 34.09"	Glomar Labrador 1	85-06-11 85-07-30	78.7 (24) 203.4 (62)	11,614 (3540) P & A	✣
Shell PCI et al Merigomish C-52	43° 31' 02.65" 60° 38' 33.76"	Sedco 706	85-06-15 85-08-12	90.2 (27.5) 246.1 (75)	12,959 (3950) P & A	✣
Mobil et al West Olympia 0-51	44° 00' 47.48" 59° 53' 03.92"	Rowan Gorilla 1	85-06-23 85-11-09	124.6 (38) 127.9 (39)	15,800 (4816) P & A	✳
Shell PCI et al North Triumph G-43	43° 42' 19.06" 59° 51' 22.02"	Sedco 709	85-09-26 86-02-01	78.7 (24.0) 241.5 (73.6)	14,777 (4504) P & A	✳
Petro-Canada et al Cohasset A-52	43° 51' 08.07" 60° 37' 43.38"	Rowan Gorilla 1	85-12-20 86-03-27	131.2 (40.0) 118.1 (36.0)	9,340 (2847) P & S	●
Shell PCI et al North Triumph B-52	43° 41' 02.44" 59° 52' 57.04"	John Shaw	86-01-24 86-03-29	72.2 (22.2) 272.3 (83.0)	12,992 (3960) P & A	✳
Shell PCI et al Tantallon M-41	43° 50' 55.99" 58° 22' 24.38"	Sedco 709	86-02-15 86-04-18	78.7 (24.0) 4974 (1516.0)	18,379 (5602) P & A	✣
Mobil et al Thebaud C-74	43° 53' 05.34" 60° 11' 35.62"	Rowan Gorilla 1	86-03-29	118.0 (36.0) 97.0 (30.0)	Drilling	⊙
Husky/Bow Valley et al West Chebucto K-20	43° 39' 44.60" 50° 47' 32.40"	Bow Drill 2	86-04-05	74.8 (22.8) 307.1 (93.6)	Drilling	⊙
Shell et al Glenelg N-49	43° 38' 59.30" 60° 07' 01.88"	SDS Vinland	86-06-01	76.1 (23.2) 237.2 (72.3)	Drilling	⊙

*deviation from original well E-58

2 DIRECTORY OF ONSHORE WELLS

WELL NAME	LATITUDE LONGITUDE	COMPANY (OPERATOR)	SPUD DATE COMPLETION DATE/ RIG RELEASE	DEPTH IN FEET (M) WELL STATUS[1]
•	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	summer, 1869	802 (224.5)
•	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	1869 1876	1600 (487.5)
NSDM Record #11	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	1874	650 (198.1)
NSDM Record #12	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	1874	900 (274.3)
•	46°06'22" 61°11'00"	Cape Breton Oil & Mining Co.	1875	1100 (335.3)
•	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	1877-05	•
•	46°06'22" 61°11'00"	•	autumn, 1877	•
NSDM Record #33	45°33'36" 62°40'00"	•	1878	280 (85.3)
NSDM Record #34	46°10'36" 62°47'07"	Victoria Oil Co.	1880	500 (152.4)
•	46°06'30" 61°07'49"	•	pre-1897	•
•	46°07'13" 61°08'26"	•	pre-1897	•
NSDM Record #52	•	•	1897	•
•	•	•	1898-04	•
•	45°04'07" 64°11'12"	•	1902	1300 (396.2)

WELL NAME	LATITUDE LONGITUDE	COMPANY (OPERATOR)	SPUD DATE COMPLETION DATE/ RIG RELEASE	DEPTH IN FEET (M) WELL STATUS[1]
NSDM Record #88	46°01'51" 61°11'48"	•	summer, 1902 •	1100 (335.3)
NSDM Record #91	45°31'18" 62°42'25"	•	1902-11-18 1903-07-10	620 (189.0)
Cheverie #1 NSDM Record #90	45°09'35" 64°09'54"	Nova Scotia Oil & Gas Co.	1903 •	1910 (582.2)
•	45°08'47" 64°08'42"	Nova Scotia Oil & Gas Co.	1903 •	1900 (579.1)
•	45°10'23" 64°09'45"	Nova Scotia Oil & Gas Co.	1903 •	1000 (304.8)
Falmouth Station #1	44°59'09" 64°10'13"	•	1911 •	1911 (582.5)
Lake Ainslie #1	46°11'03" 61°11'10"	Maritime Oil & Gas Co. Ltd.	1912 •	800 (243.8)
Lake Ainslie #2	46°11'07" 61°11'05"	Maritime Oil & Gas Co. Ltd.	1912 •	1612 (491.3)
Lake Ainslie #3	46°11'05" 61°11'06"	Maritime Oil & Gas Co. Ltd.	1912-1914 •	1120 (341.4)
Lake Ainslie #4	46°11'04" 61°10'56"	Maritime Oil & Gas Co. Ltd.	1912-1914 •	1110 (338.3)
Lake Ainslie #5	46°10'55" 61°11'07"	Maritime Oil & Gas Co. Ltd.	1912-1914 •	870 (265.2)
Lake Ainslie #6	46°10'55" 61°11'07"	Maritime Oil & Gas Co. Ltd.	1912-1914 •	•
•	46°09'48" 61°12'46"	Gulf Oil Co.	1926 •	900 (274.3)
NSDM Record #484 Borehole #1	46°01'35" 64°27'13"	Gulf Oil Co.	1926-06-17 1926-09-17	702 (214.0)
NSDM Record #485 Borehole #2	46°01'36" 61°27'13"	Gulf Oil Co.	1926-09-18 1927-01-10	582 (177.4)
NSDM Record #505 Borehole #1	46°02'32" 61°28'03"	Gulf Oil Co.	1926-09-11 1926-09-19	76.2 (23.2)
NSDM Record #506 Borehole #2	46°02'34" 61°27'57"	Gulf Oil Co.	1926-09-22 1926-10-12	215 (65.5)
NSDM Record #524 Borehole #3	46°02'36" 61°27'57"	Gulf Oil Co.	1926-10-13 1926-10-23	110 (33.5)
NSDM Record #525 Borehole #4	46°02'36" 61°27'57"	Gulf Oil Co.	1926-10-23 1926-11-04	220 (67.1)
NSDM Record #526 Borehole #5	46°02'29" 61°27'57"	Gulf Oil Co.	1926-11-05 1926-11-12	177 (53.9)
NSDM Record #527 Borehole #6	46°02'35" 61°27'57"	Gulf Oil Co.	1926-11-13 1927-02-28	648 (197.5)
NSDM Record #528 Borehole #7	46°01'40" 61°26'46"	Gulf Oil Co.	1927-03-06 1927-03-30	600 (182.9)
NSDM Record #529 Borehole #8	42°02'39" 61°27'57"	Gulf Oil Co.	1927-04-01 1927-04-26	664 (202.4)
NSDM Record #530 Borehole #9	46°03'21" 61°20'45"	Gulf Oil Co.	1927-05-05 1927-06-10	661 (201.5)
NSDM Record #531 Borehole #1	46°24'50" 61°06'15"	Gulf Oil Co.	1927-06-11 1927-06-24	81 (24.7)
NSDM Record #532 Borehole #2	46°24'48" 61°06'15"	Gulf Oil Co.	1927-05-25 1927-08-04	712 (217.0)
NSDM Record #533 Borehole #3	46°24'46" 61°06'15"	Gulf Oil Co.	1927-08-05 1927-08-29	189 (57.6)
NSDM Record #534 Borehole #4	46°24'44" 61°06'15"	Gulf Oil Co.	1927-08-30 1927-09-14	210 (64.0)
NSMD Record #535 Borehole #5	46°25'35" 61°05'04"	Gulf Oil Co.	1927-09-15 1927-10-07	360 (109.7)
Nappan #1	45°46'05" 64°13'42"	Imperial Oil Ltd.	1927-11 1927-12	673 (205.1)
Nappan #2	45°46'27" 64°13'52"	Imperial Oil Ltd.	1927-11 1927-12	159 (48.5)

WELL NAME	LATITUDE LONGITUDE	COMPANY (OPERATOR)	SPUD DATE COMPLETION DATE/ RIG RELEASE	DEPTH IN FEET (M) WELL STATUS[1]
Nappan #3	45°46'18" 64°13'41"	Imperial Oil Ltd.	1927-12 1928-01	210 (54.0)
Nappan #4	45°46'51" 64°14'08"	Imperial Oil Ltd.	1928-1929	795 (242.3)
Nappan #5	45°47'00" 64°11'24"	Imperial Oil Ltd.	1928-1929	795 (242.3)
Nappan #6	45°47'00" 64°11'24"	Imperial Oil Ltd.	1928-1929	298 (90.8)
NSDM Record #710, Nappan #7, Borehole #1	45°47'48" 64°13'24"	Imperial Oil Ltd.	1929-09-09 1929-10-15	432 (131.7)
Nappan #8	45°47'20" 64°13'21"	Imperial Oil Ltd.	1929	340 (103.6)
NSDM Record #720 Nappan #9 Borehole #2	45°47'55" 64°12'14"	Imperial Oil Ltd.	1929-10-31 1929-12-02	740 (225.6)
Nappan #10	45°48'00" 64°13'21"	Imperial Oil Ltd.	1929-1930	316 (96.3)
Scotsburn No. 1	45°37'52" 63°00'13"	Imperial Oil Ltd.	1930-09-09 1931-01-03	1980 (603.5)
Amherst No. 1	45°47'12" 64°13'23"	Imperial Oil Ltd.	1931-03-09 1931-07-27	4134 (1260)
McIsaac Gas Well	46°05'42" 61°11'48"		1938	1700 (518.2)
Mac No. 1	46°01'49" 61°27'37"	Lion Oil Refining Co.	1944	5579 (1701)
Mary No. 1	46°02'06" 61°28'06"	Lion Oil Refining Co.	1944	6869 (2094)
Anthony No. 1	45°10'39" 63°43'54"	Nova Scotia Oil & Gas Co.	1944 1944/45	638 (194)
Anthony No. 2	45°10'40" 63°43'54"	Nova Scotia Oil & Gas Co.	1945 spring, 1945	870 (265.2)
Sunoco No. 1	45°47'05" 64°13'39"	Sun Oil Co. Ltd.	spring, 1945 Nov., 1945	6499 (1981)
Sunoco No. 1A	45°47'05" 64°13'39"	Sun Oil Co. Ltd.	1946-04-15 1947-09-01	11,504 (3506)
NSDM Record No. 1171	45°35'30" 62°30'12"	Pictou Petroleum Co.	1946-05-16 1946-07-16	645 (197)
NSDM Record No. 1172	45°35'25" 62°30'15"	Pictou Petroleum Co.	1946-05-16 1946-07-16	36.5 (11.1)
NSDM Record No. 1096	46°07'55" 60°00'18"	Sydney Petroleum Co.	1946-09-01 1946-10-24	253 (77)
NSDM Record No. 1097	46°08'12" 59°59'58"	Sydney Petroleum Co.	1946-09-01 1046-10-24	233 (71)
NSDM Record No. 1098	46°07'06" 60°01'55"	Sydney Petroleum Co.	1946-09-01 1946-10-24	81 (25)
NSDM Record No. 1235	45°58'29" 60°56'50"	Little Narrows Petroleum Co.	1946-11-26 1947-07-08	327 (99.7)
NSDM Record No. 1236	45°58'29" 60°56'50"	Little Narrows Petroleum Co.	1946-11-26 1947-07-08	1614 (492)
NSDM Record No. 1452	45°58'56" 60°56'45"	Little Narrows Petroleum Co.	1947-10-27 1948-04-22	2004 (610.8)
NSDM Record No. 1453	46°05'49" 61°14'53"	Little Narrows Petroleum Co.	1948-08-09 1948-09-30	694 (211.5)
NSDM Record No. 1505	45°44'17" 62°01'05"	Nova Scotia Dept. of Mines	1949-07-13 1949-09-19	712 (217)
Anthony #3	45°10'42" 63°43'54"	Nova Scotia Oil & Gas Co.	1951 1951	2588 (788.8)
Inverness #1	46°03'42" 61°23'48"	Imperial Oil Ltd.	1958-08-26 1958-09-10	510 (155.5)
Inverness #2	46°02'06" 61°22'35"	Imperial Oil Ltd.	1958-08-26 1958-09-10	260 (79.3)

WELL NAME	LATITUDE LONGITUDE	COMPANY (OPERATOR)	SPUD DATE COMPLETION DATE/ RIG RELEASE	DEPTH IN FEET (M) WELL STATUS[1]
Inverness #3	46°06'54" 61°11'46"	Imperial Oil Ltd.	1958-08-26 1958-09-10	480 (146.3)
Inverness #4	45°55'30" 61°27'24"	Imperial Oil Ltd.	1958-08-26 1958-09-10	470 (143.3)
Inverness #5	46°05'12" 61°09'43"	Imperial Oil Ltd.	1958-08-26 1958-09-10	100 (30.5)
Inverness #6	46°04'58" 61°09'39"	Imperial Oil Ltd.	1958-08-26 1958-09-10	170 (51.8)
Lura #1 NSDM Record #2671	45°39'42" 61°50'50"	Lura Corp. Ltd.	1958-10-04 1958-12-12	1993 (607.5)
Mabou #1	46°01'25" 61°24'03"	Imperial Oil Ltd.	1959-10-24 1959-12-31	5145 (1568.2)
Port Hood #1	46°01'55" 61°28'57"	Imperial Oil Ltd.	1960-01-16 1960-04-11	9840 (2999.2)
Pacific Fox Harbour	45°50'56" 63°30'47"	Pacific Petroleum Ltd.	1963-12-10 1964-05-04	9853 (3003.2)
Birch Grove #1	46°08'42" 59°56'05"	Murphy Oil Co. Ltd.	1968-02-08 1968-03-24	4408 (1343.6)
Wallace Station #1	45°46'15" 63°30'30"	Anschutz Corp.	1973-12-22 1973-08-29	14,883 (4536)
Hastings #1	45°50'35" 64°04'52"	Gulf Oil Canada Ltd.	1975-06-11 1975-08-11	9644 (2939.5)
Noel #1	45°12'45" 63°42'17"	Soquip A.C.C. et al	1975-07-18 1975-08-13	4750 (1447.8)
Bras d'or Anschutz #1	45°39'11" 61°53'1"	Bras d'or Oil Company Ltd.	1976-07-27 1976-08-14	3427 (1044.6)
Bras d'or No. 3A-78	45°52'30" 61°00'20"	Chevron Standard Ltd.	1978-07-23 *	597 (182)
Bras d'or #1	45°52'30" 61°00'20"	Chevron Standard Ltd.	1979-09-21 1979-09-30	709 (216)
Bras d'or #2	45°52'45" 61°00'05"	Chevron Standard Ltd.	1979-10-03 1979-10-15	1230.3 (375)
Malagawatch #1	45°52'05" 60°55'18"	Chevron Standard Ltd.	1979-10-31 1979-11-23	10,203 (3110)
Scotsburn #2	45°38'22" 63°00'11"	Chevron Standard Ltd.	1981-08-11 1981-11-29	8654.9 (2638)
Port Malcom	45°34'50" 61°17'44"	Corkan Engineering of Canada Ltd.	1983-09-13 1983-10-16	3582 (1091.8)
Bear Island	45°34'22" 61°17'54"	Corkan Engineering of Canada Ltd.	1983-09-30 1984-01-11	1359 (414.2)
Loch Lomond	45°46'11" 60°35'27"	Corkan Engineering of Canada Ltd.	1983-10-28 1984-03-01	810 (246.9)
North Glen	45°50'32" 60°30'10"	Corkan Engineering of Canada Ltd.	1983-10-27 1984-03-02	4120 (1255.8)

* Data is incomplete on these wells
[1] All wells P & A

3 GLOSSARY

argillaceous rocks a group of sedimentary rocks, commonly consisting of clay. Includes shales, mudstones, siltstones, and marls.

blowout an uncontrolled entry of formation fluid(s) into a well such that the drilling fluid is displaced.

carbonates sedimentary rocks composed primarily of calcium carbonate (limestone) or calcium magnesium carbonate (dolomite). Petroleum reservoirs are sometimes made up of carbonate rocks.

clastics sedimentary rocks composed of fragments of pre-existing rocks. Sandstone is a clastic rock.

condensates hydrocarbons that condense to form liquids at the surface due to reduced pressure and temperature. Condensates actually exist in a gaseous state in the reservoir. These liquids may be colorless or have red, yellow, blue, or green shades. Others are indistinguishable from very light crude oils. Condensates usually include such compounds as pentanes (C_5H_{12}) and some of the heavier hydrocarbons.

conglomerates rocks consisting of rounded or subrounded fragments from beaches, flood plains, etc., which have become cemented together.

crude oil hydrocarbons produced from a well that are liquids at the surface and also are in liquid state in the reservoir. Crude oil generally varies greatly in its properties and composition.

diapir an irregular upfold in geological strata in which overlying rocks are pierced by a core of low density material which has been pushed up from below.

fluvial a term used to denote being found in or produced by a river.

fractionation the process of separating liquids or gases by using the differences in their boiling points.

hydrocarbons compounds composed of carbon and hydrogen. A great variety of hydrocarbons exist. Petroleum is a mixture of many different hydrocarbons.

kick a sudden rise in the pressure of the circulating drilling fluid as it meets a higher pressure in the formation being drilled.

lacustrine a term used to denote being found in or produced by processes in a lake.

natural gas refers to light hydrocarbon compounds which, at surface temperature and pressure conditions, are in a gaseous state. These typically include compounds such as methane (CH_4), ethane (C_2H_6), propane (C_3H_8), and butane (C_4H_{10}).

onlap progressively younger strata resting upon older strata.

overpressure the abnormally high pressure encountered in some subsurface formations. An example is the overpressured sandstones in the Sable Subbasin on the Scotian Shelf.

permeability a measure of the ease with which fluids can flow through a porous rock; the fluid conductivity of a porous medium.

physiography the description of the features and phenomenon of nature.

porosity the amount of void space in a rock that can contain fluids. Measured as a percentage of rock volume.

stratigraphy the branch of geology concerned with the study of the origin, composition, distribution, and succession of rock strata (beds of rock).

topography the science of displaying or representing the surface features of a region; as on maps and charts.